Bellevue Utilities Asset Management Approach

Pacific Northwest Section
American Water Works Association

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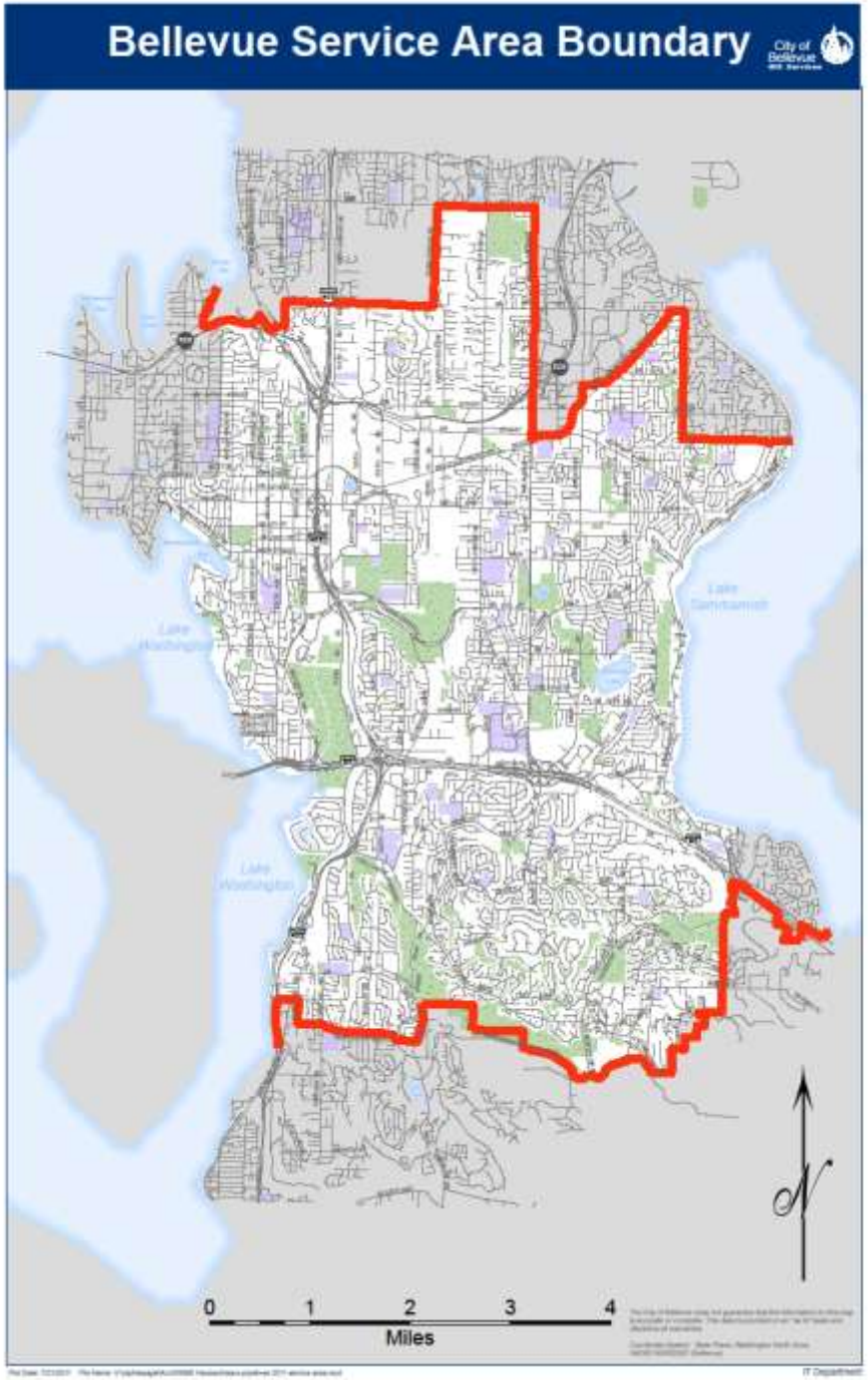
Bellevue, Washington

Service Area

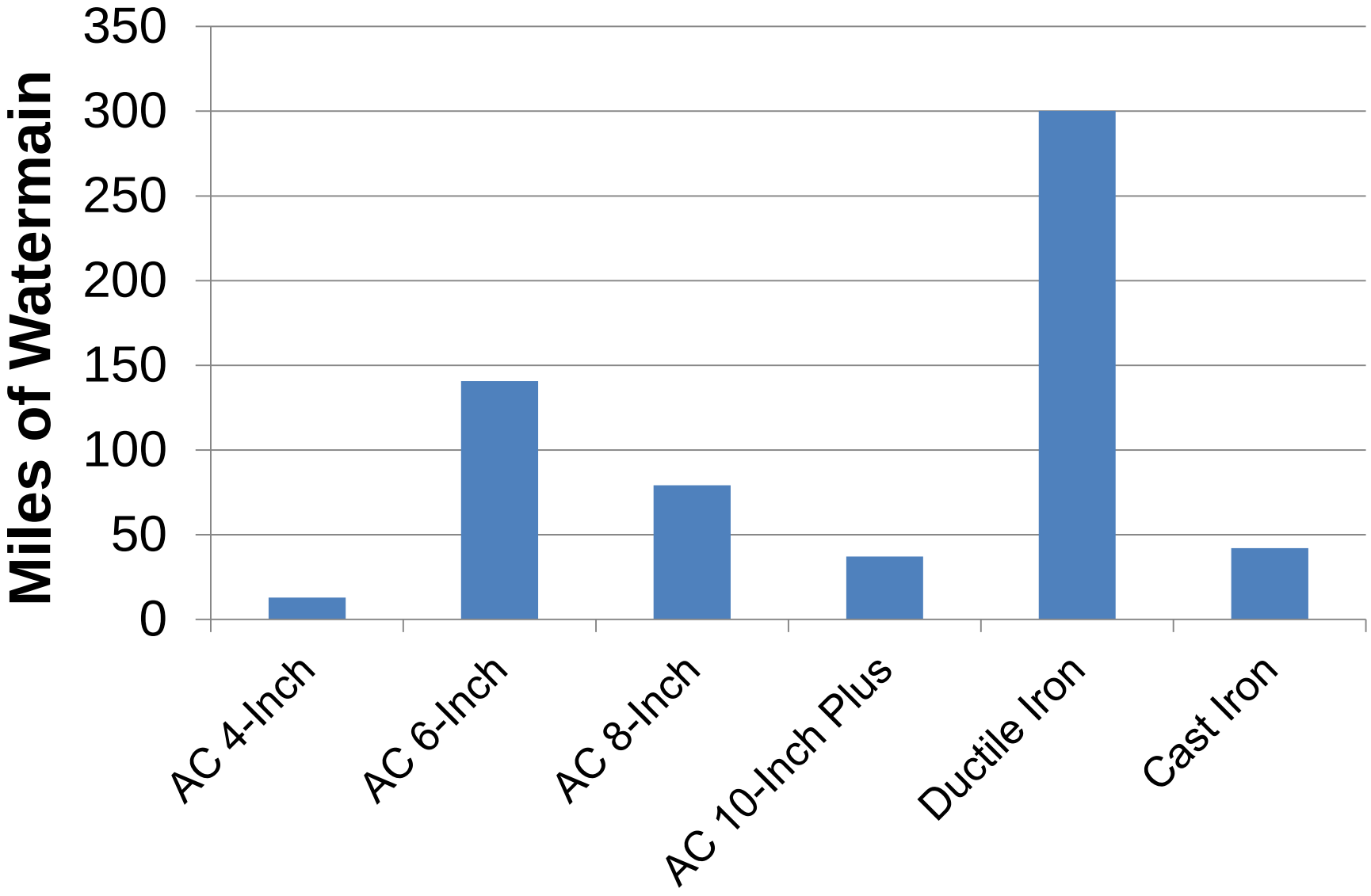
- Bellevue
- Beaux Arts, Clyde Hill, Hunts Point, Medina, Yarrow Point and unincorporated areas
- 135,000 residents
- Three Utilities
  - Water
  - Wastewater
  - Stormwater (COB)



Water Utility

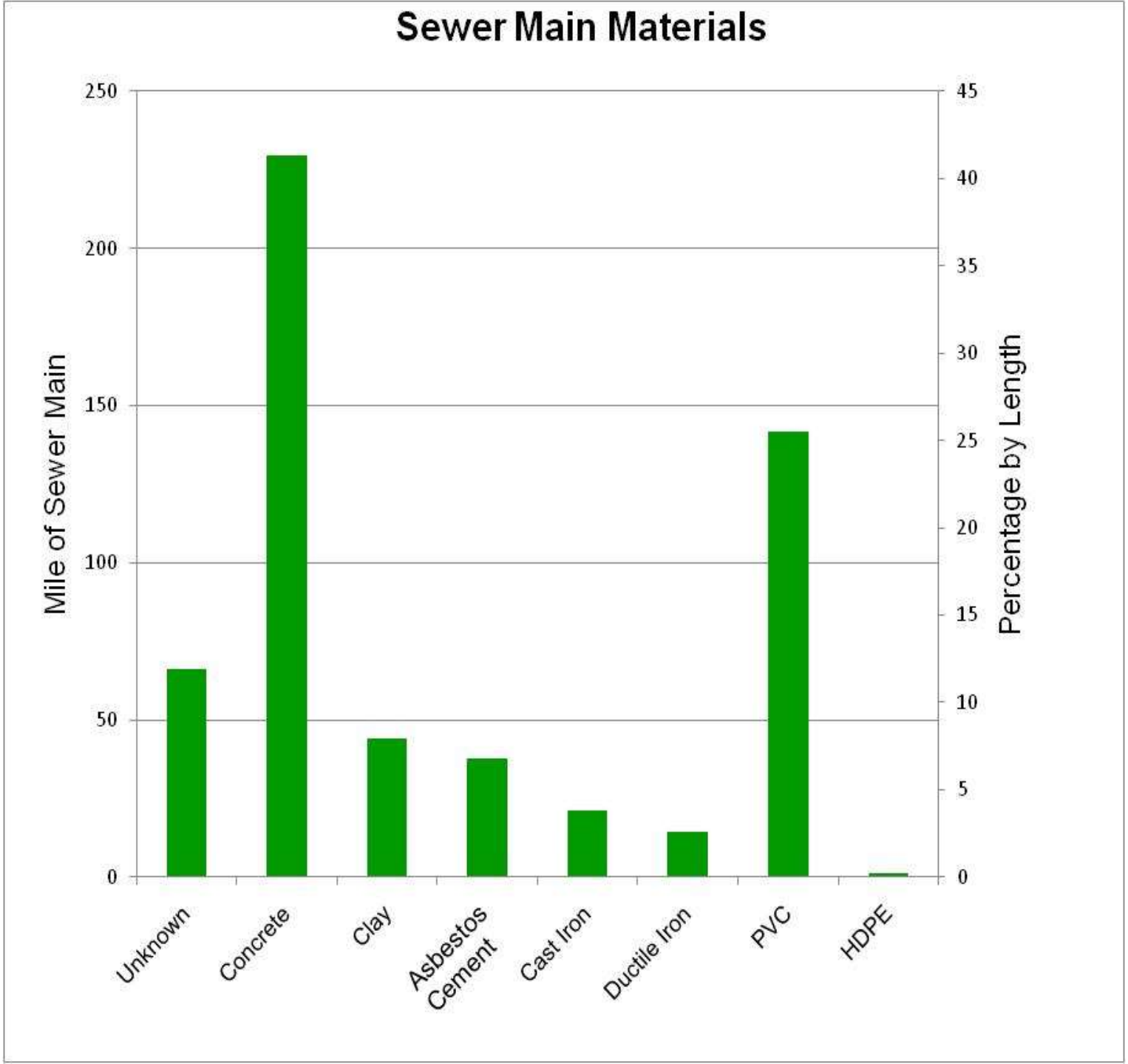
- 619 miles of watermain
- 30,000 plus saddles and services
- 25 reservoirs
- 23 pump stations
- 142 PRV’s and 13 Inlets
- Approximately 300 commercial meters
- 41,000 Meter Connections

Watermain Inventory

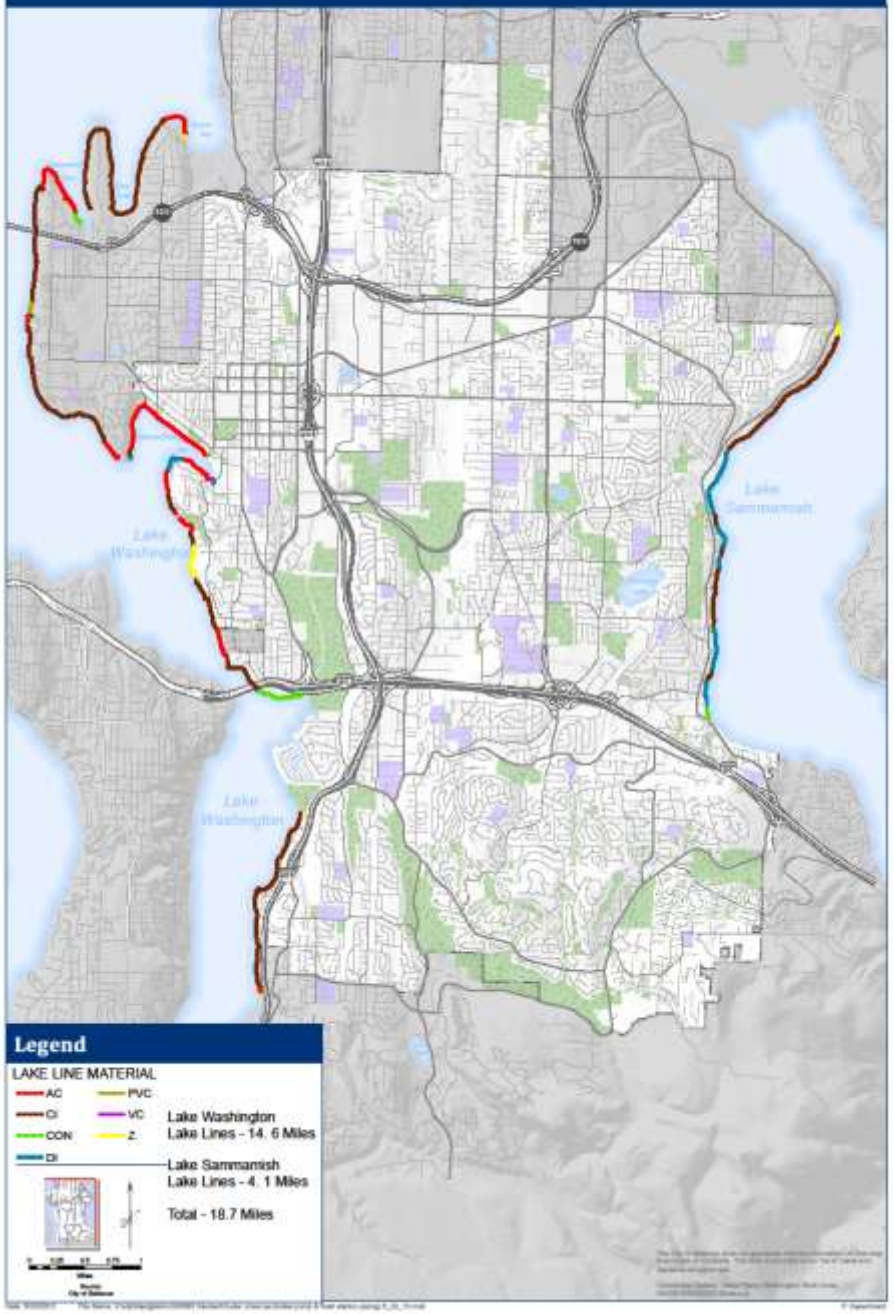


Wastewater Utility

- Pipelines
  - 525 miles of sewer main
  - 130 miles of stubs
  - 19.4 miles of lake line
  - 5.8 miles of force main
- 36 pump stations
- 10 flush stations
- 13449 manholes


Sewer Main Materials
Mile of Sewer Main
Percentage by Length
250
200
150
100
50
0
45
40
35
30
25
20
15
10
5
0
Unknown
Concrete
Clay
Asbestos Cement
Cast Iron
Ductile Iron
PVC
HDPE

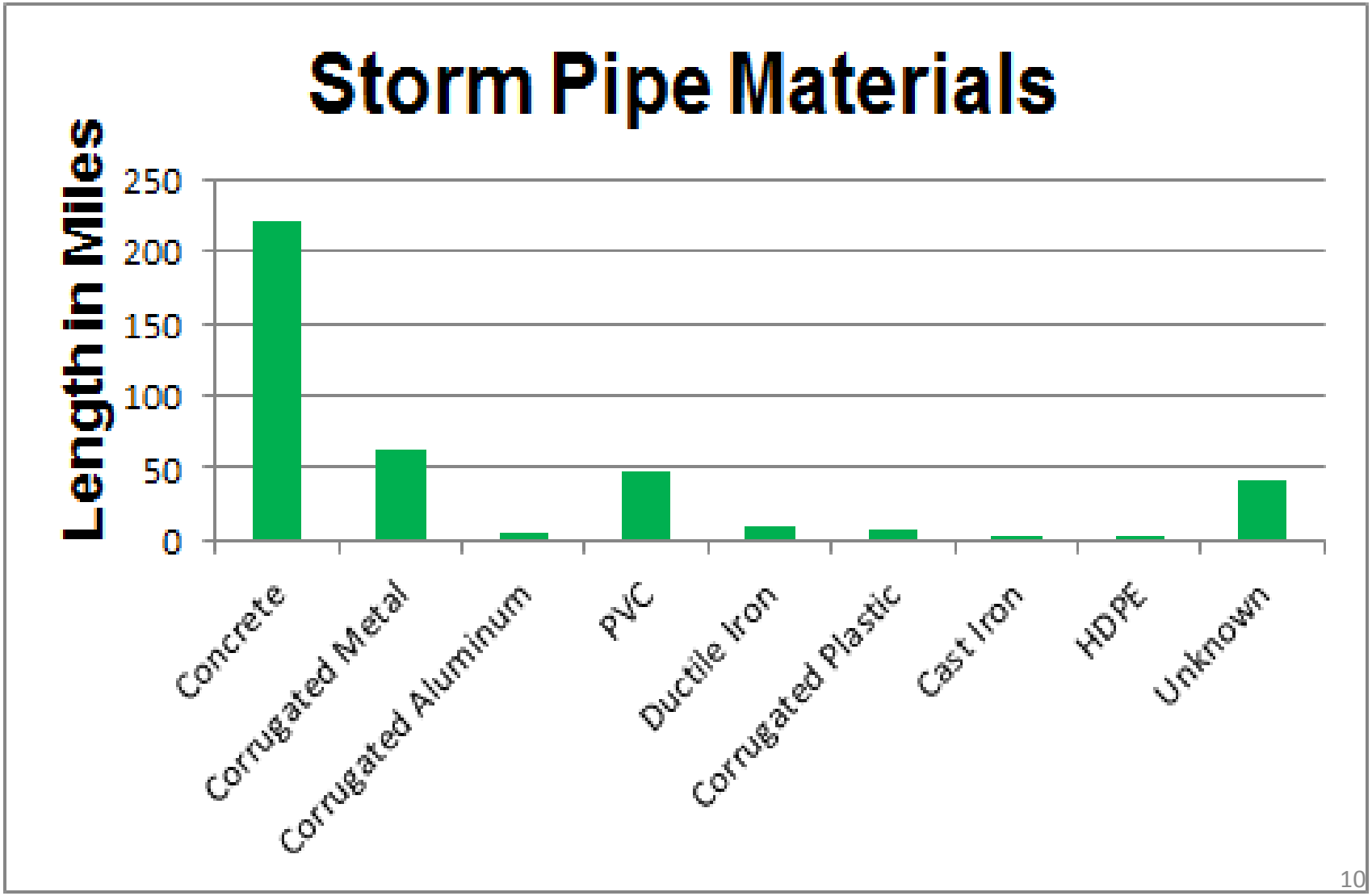
Lake Lines

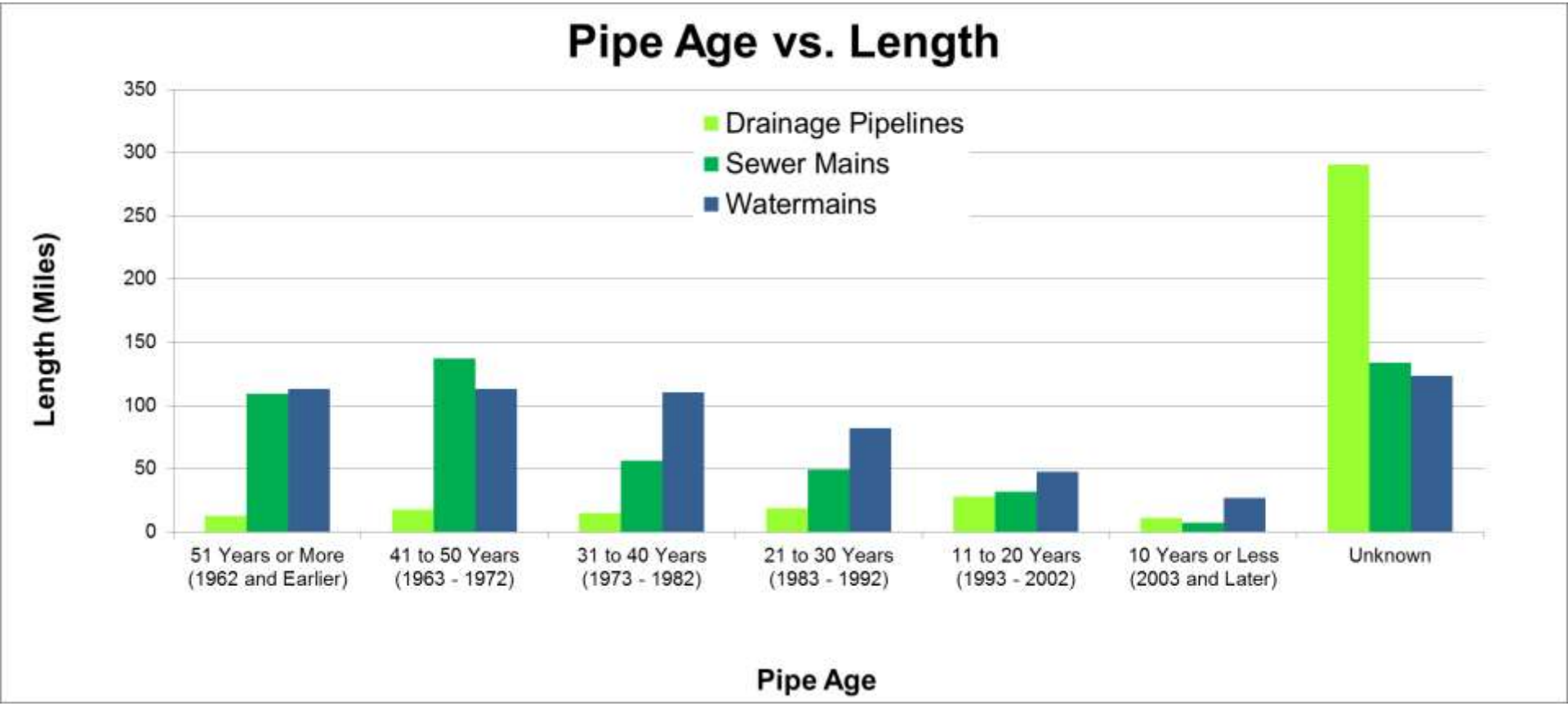

Lake Washington
Lake Sammamish
Lake Washington
Legend
LAKE LINE MATERIAL
AC
PVC
CI
VC
CON
Z
DI
Lake Washington
Lake Lines - 14. 6 Miles
Lake Sammamish
Lake Lines - 4. 1 Miles
Total - 18.7 Miles

Stormwater Utility

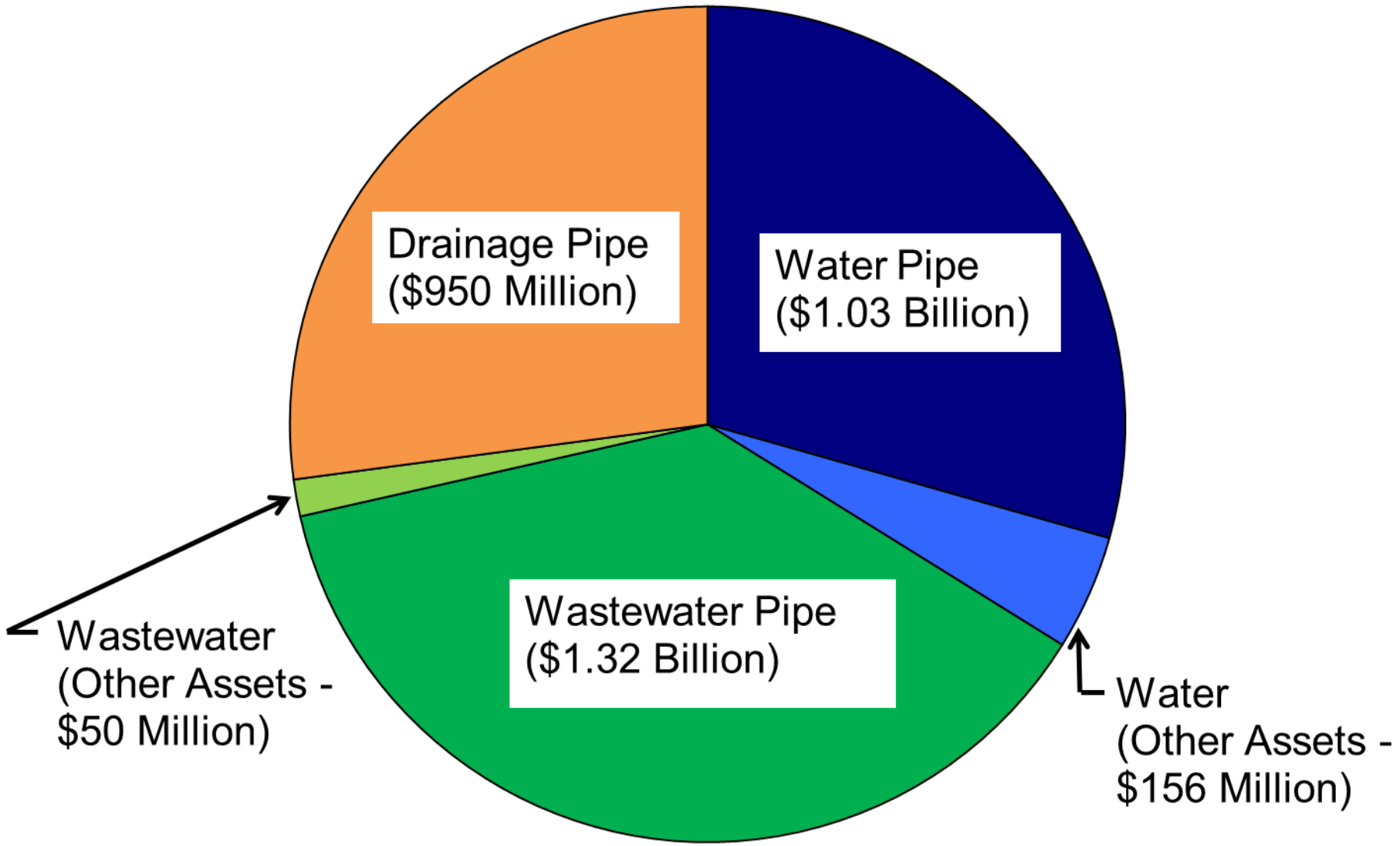
- Stormwater conveyance
  - 400 miles of stormwater Pipe (CCTV and defect repair)
  - 86 (?) miles of ditches
  - A couple hundred steam culverts
- 19188 catch basins and 2283 manholes
- 118 oil/water separators
- 11 regional detention ponds

Stormwater Pipe Data Collection




Pipe Age vs. Length
Length (Miles)
350
300
250
200
150
100
50
0
Drainage Pipelines
Sewer Mains
Watermains
51 Years or More (1962 and Earlier)
41 to 50 Years (1963 - 1972)
31 to 40 Years (1973 - 1982)
21 to 30 Years (1983 - 1992)
11 to 20 Years (1993 - 2002)
10 Years or Less (2003 and Later)
Unknown
Pipe Age

Asset Construction Cost - $3.5 Billion



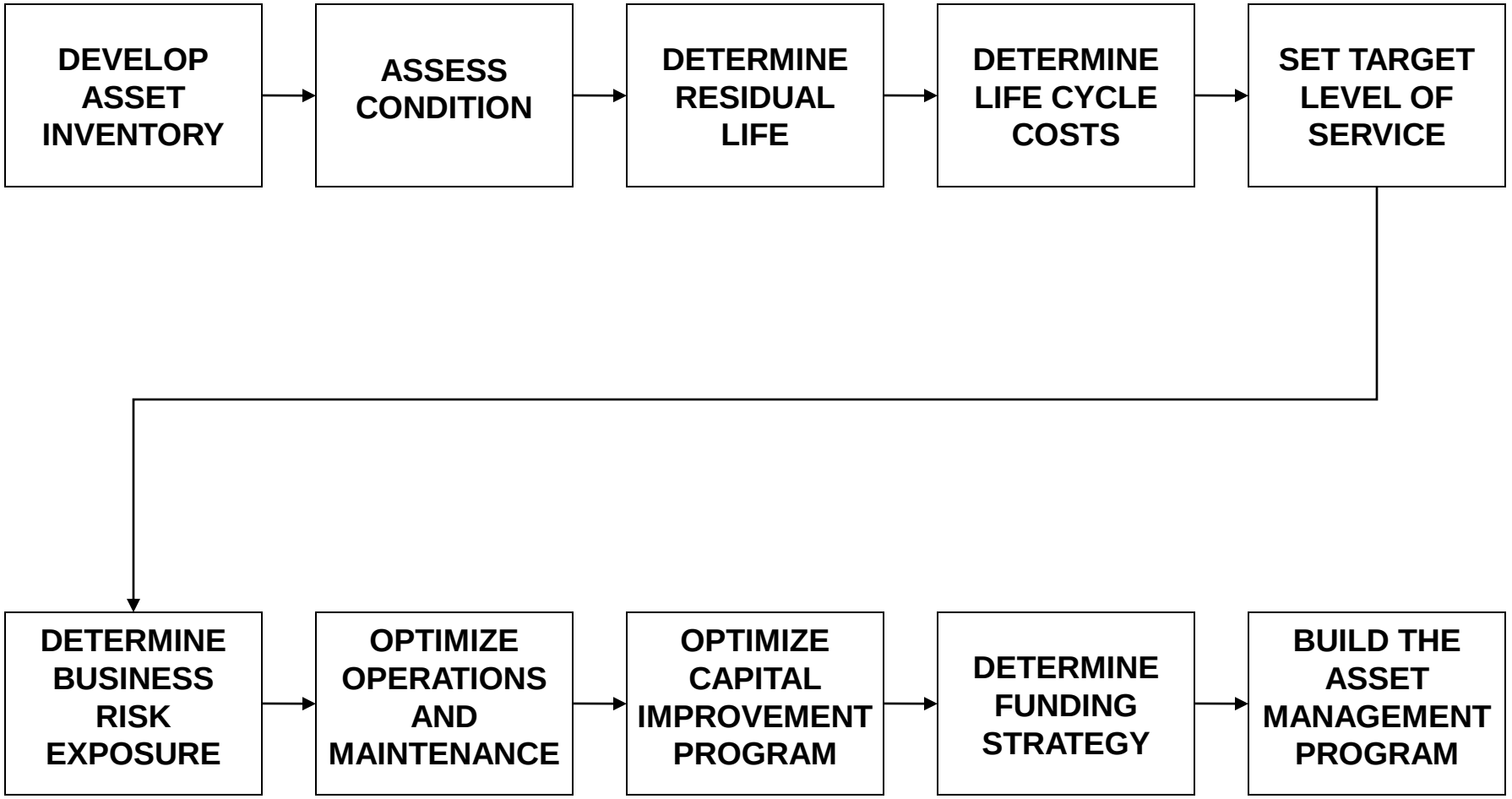
Asset Management

- Optimizing of the cost of
  - acquiring,
  - operating,
  - maintaining,
  - renewing and
  - replacing infrastructure assets…
- While meeting service levels expected by the community and required by regulators…
- At an acceptable level of risk

Asset Management Program Goal – Good Stewardship of the Community's Investment in Utility Services

- Cost Effective Allocation of Resources
- Facilitate More Informed Decision Making
- Long Range Planning

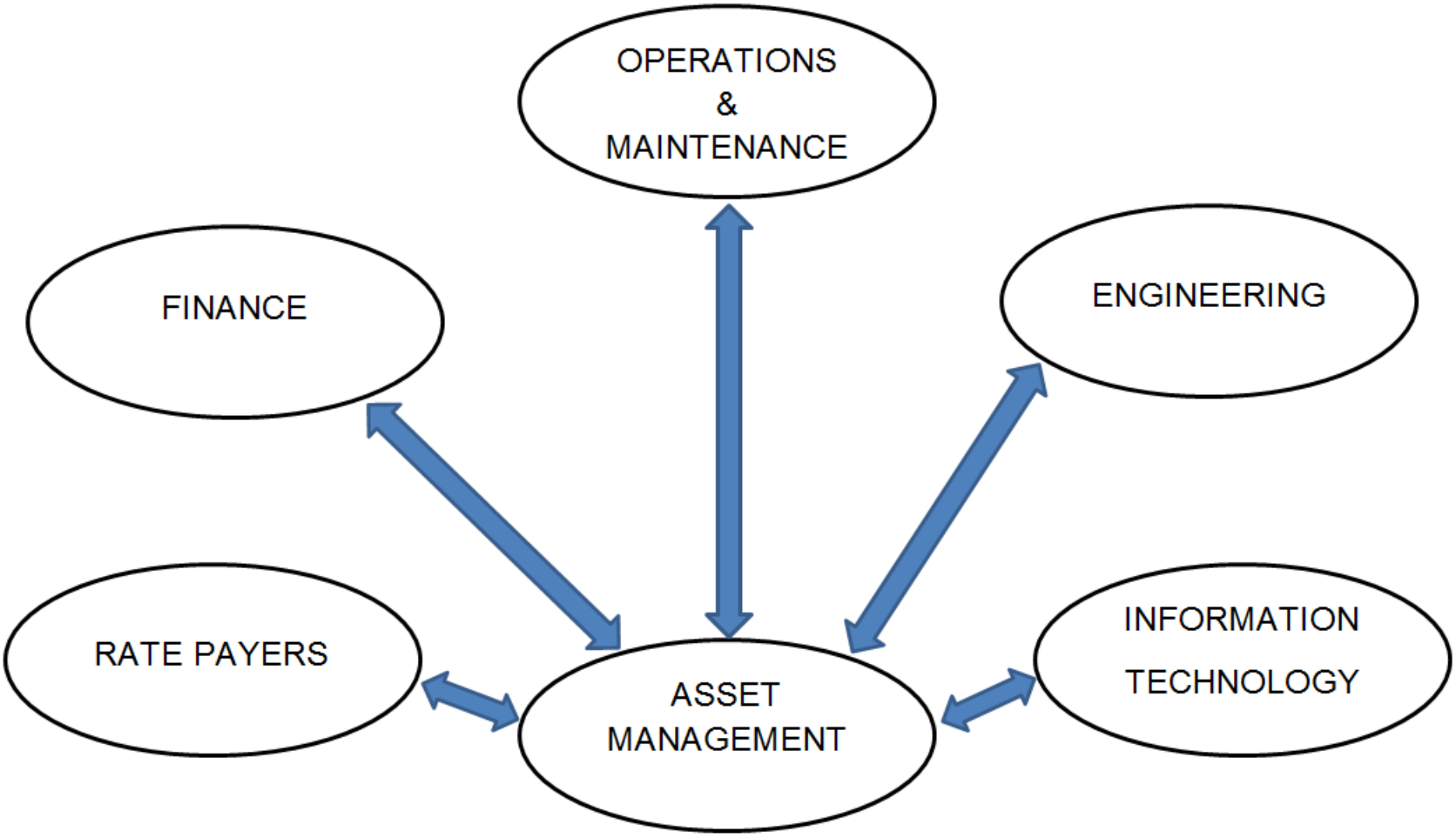
EPA Framework
Asset Management Ten Core Processes



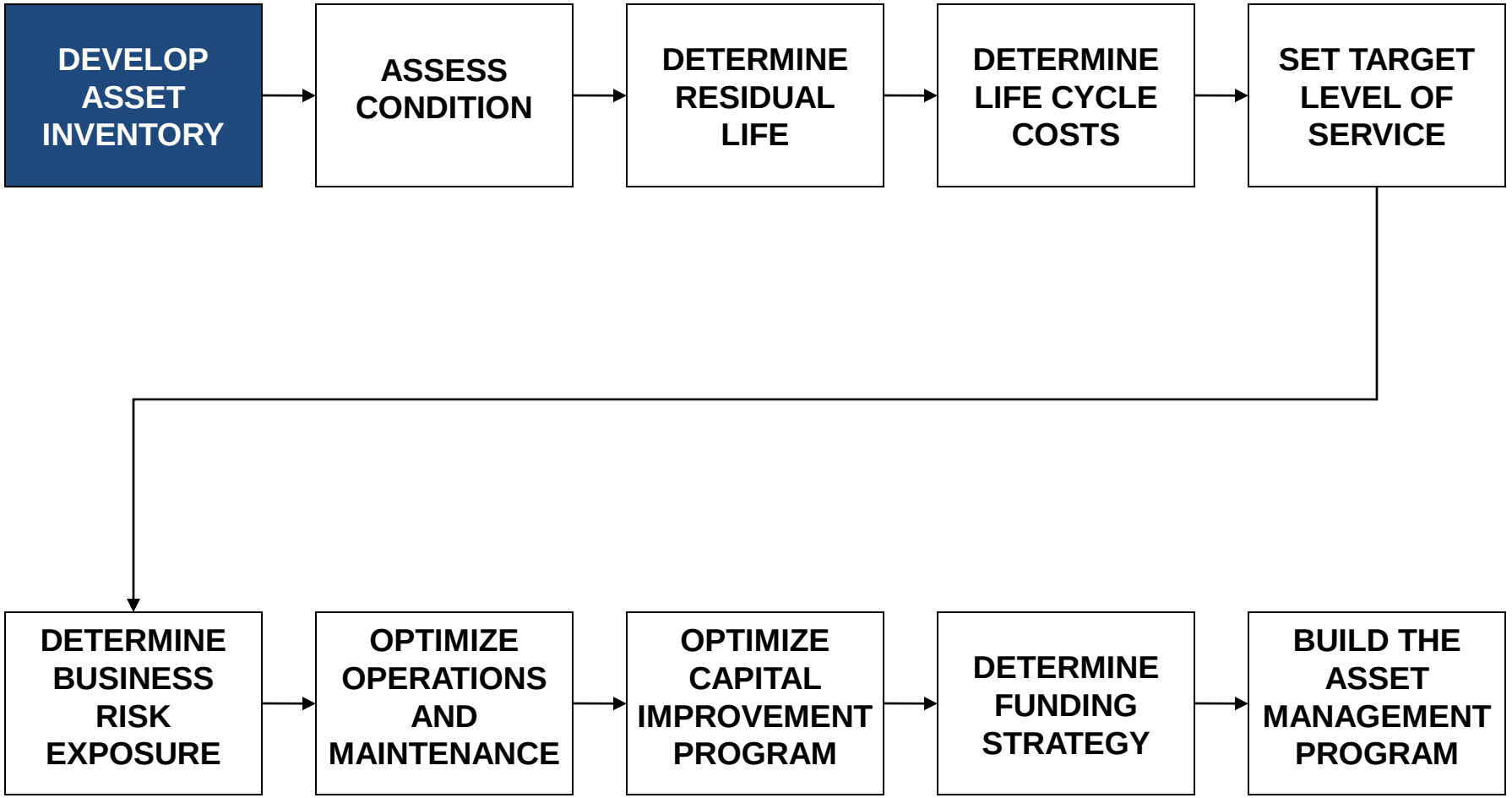
Asset Management Five Core Objectives

1. Determine state of the assets
2. Determine what customer service levels are required
3. Determine asset criticality
4. Determine the strategies that provide the required level of service at the lowest life cycle cost
5. Determine the funding strategy

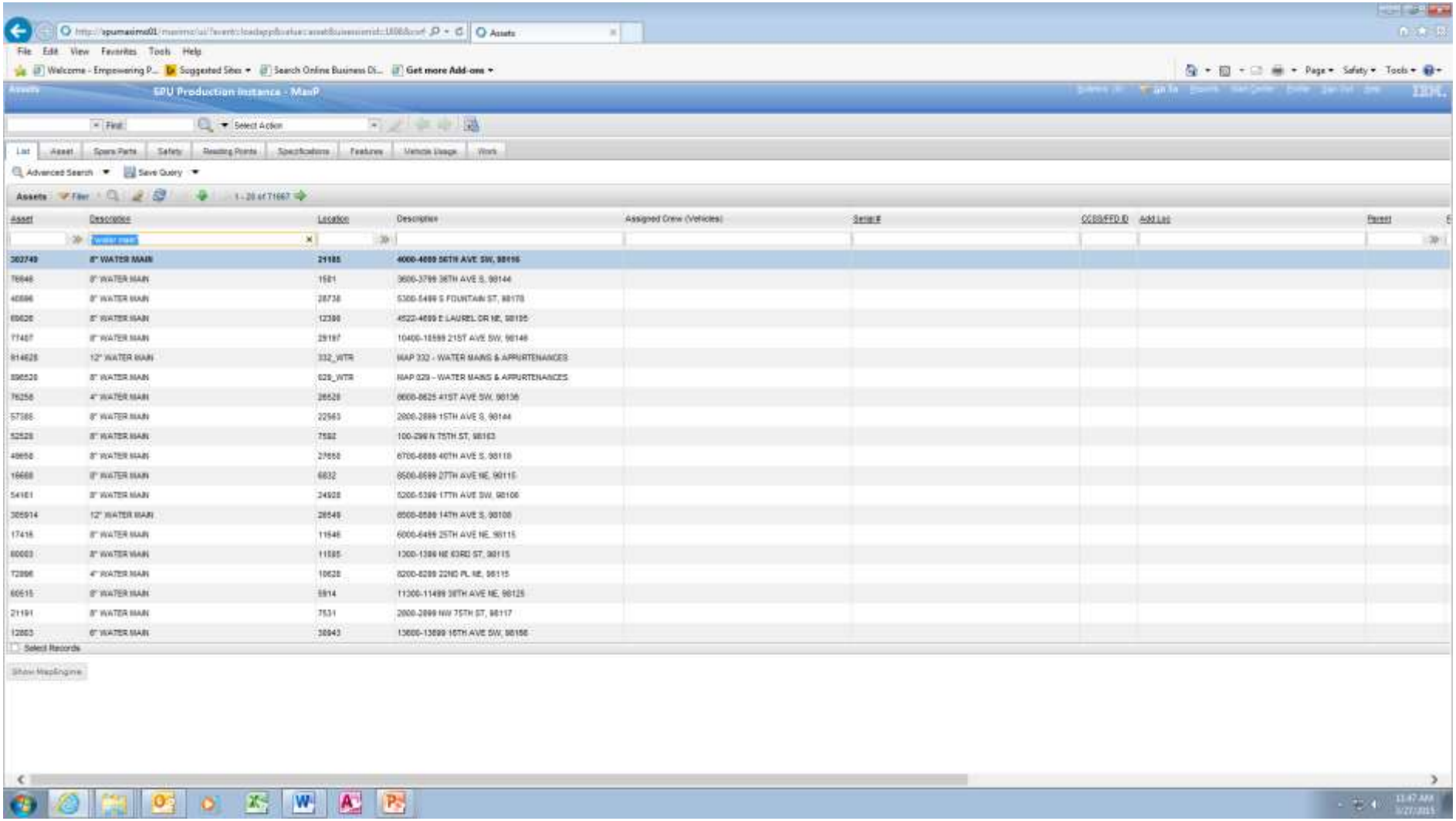
Asset Management Team



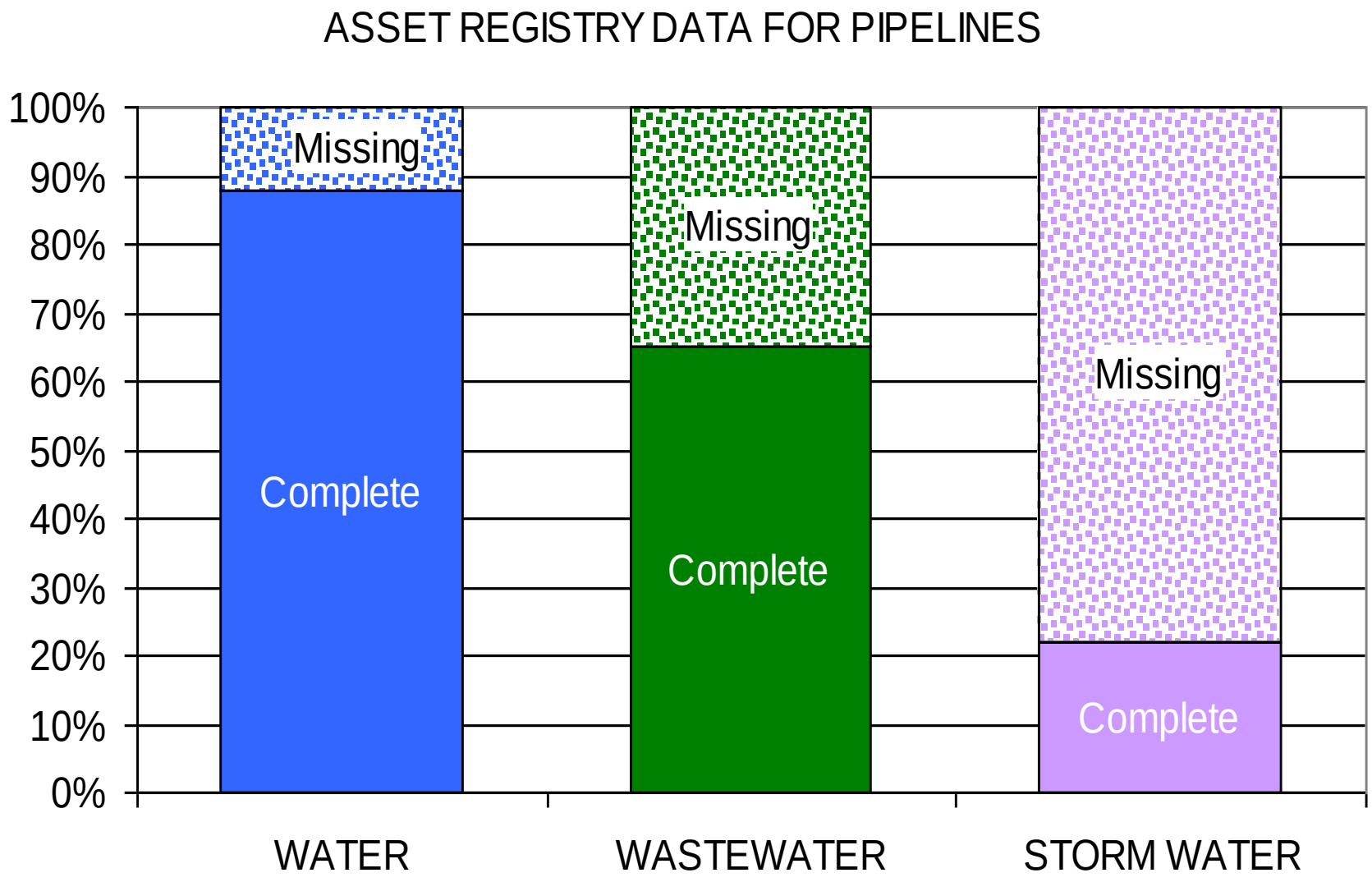
Asset Management Ten Core Processes



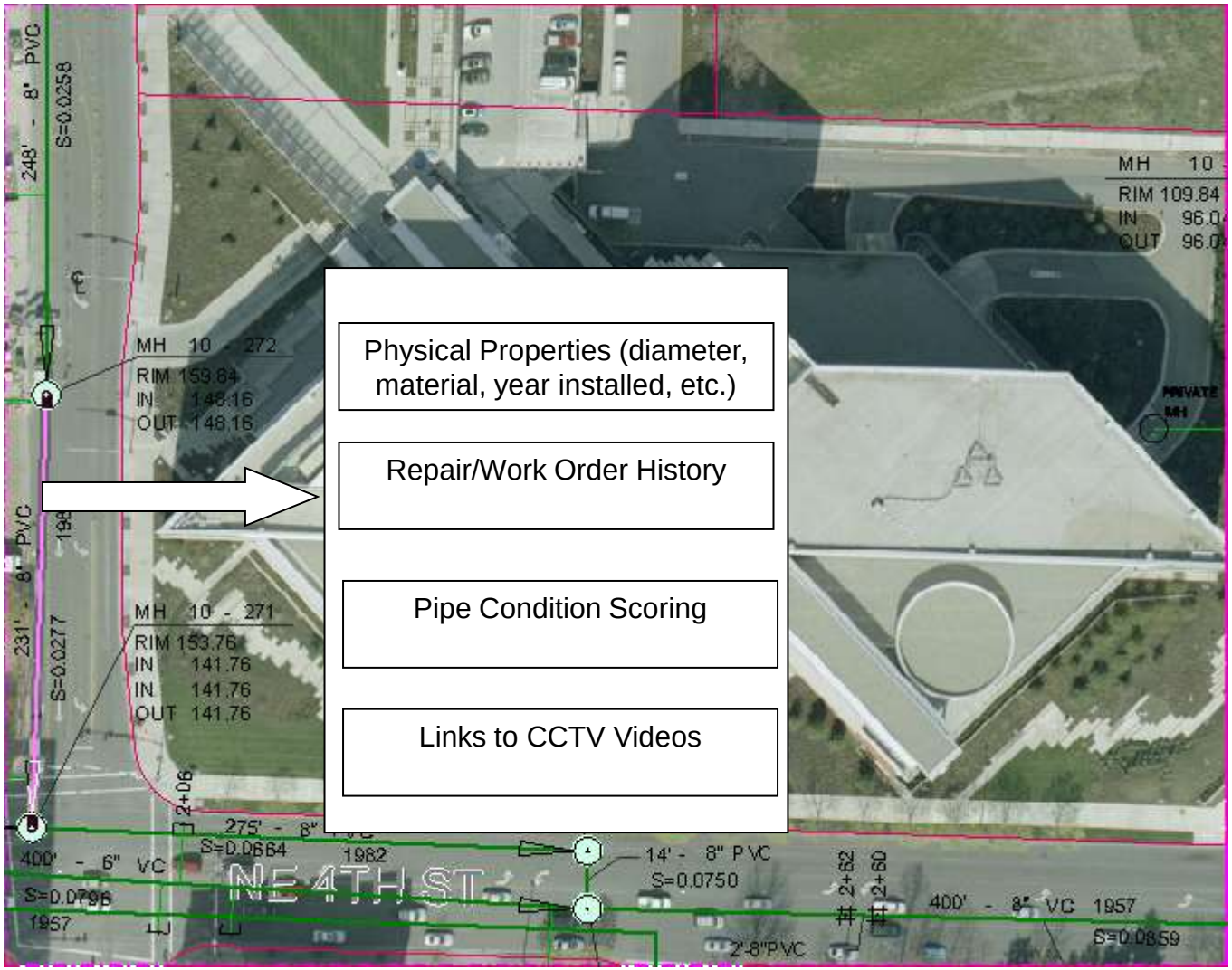
CMMS - Maximo


EDU Production Instance - MaxP
Assets
Asset
Description
Location
Description
Assigned Crew (Vehicles)
Serial #
CCSS/FFD ID
Add Loc
Parent
302749 8" WATER MAIN 21985 4000-4099 56TH AVE SW, 98116
76946 8" WATER MAIN 1581 3600-3799 38TH AVE S, 98144
40896 8" WATER MAIN 28738 5300-5499 S FOUNTAIN ST, 98178
69626 8" WATER MAIN 12386 4522-4699 E LAUREL DR NE, 98155
77467 8" WATER MAIN 29197 10400-10599 21ST AVE SW, 98146
914628 12" WATER MAIN 332_WTR MAP 332 - WATER MAINS & APPURTENANCES
896528 8" WATER MAIN 029_WTR MAP 029 - WATER MAINS & APPURTENANCES
76256 4" WATER MAIN 26628 6600-6625 41ST AVE SW, 98136
57386 8" WATER MAIN 22963 2800-2899 15TH AVE S, 98144
52528 8" WATER MAIN 7582 100-299 N 75TH ST, 98103
49656 8" WATER MAIN 27656 6700-6899 40TH AVE S, 98118
16668 8" WATER MAIN 6832 8500-8599 27TH AVE NE, 98115
54161 8" WATER MAIN 24928 5200-5399 17TH AVE SW, 98106
305914 12" WATER MAIN 28549 8500-8599 14TH AVE S, 98108
17416 8" WATER MAIN 11646 6000-6499 25TH AVE NE, 98115
60003 8" WATER MAIN 11585 1300-1399 NE 63RD ST, 98115
72896 4" WATER MAIN 10628 8200-8299 22ND PL NE, 98115
60515 8" WATER MAIN 5814 11300-11499 38TH AVE NE, 98125
21191 8" WATER MAIN 7531 2800-2899 NW 75TH ST, 98117
12863 6" WATER MAIN 30943 13600-13699 16TH AVE SW, 98166

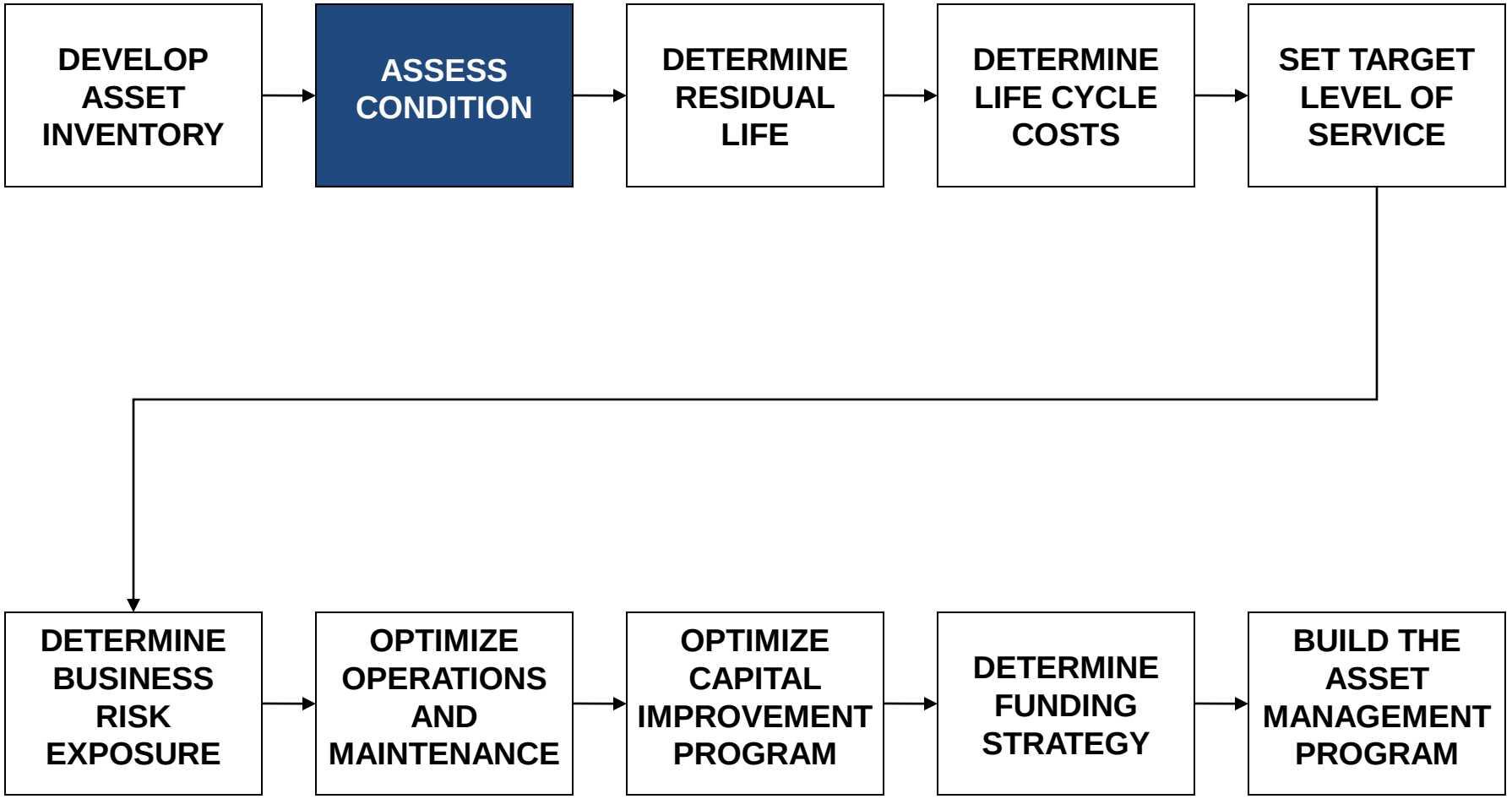
Asset Inventory – Data Augmentation



Integrated Data Management



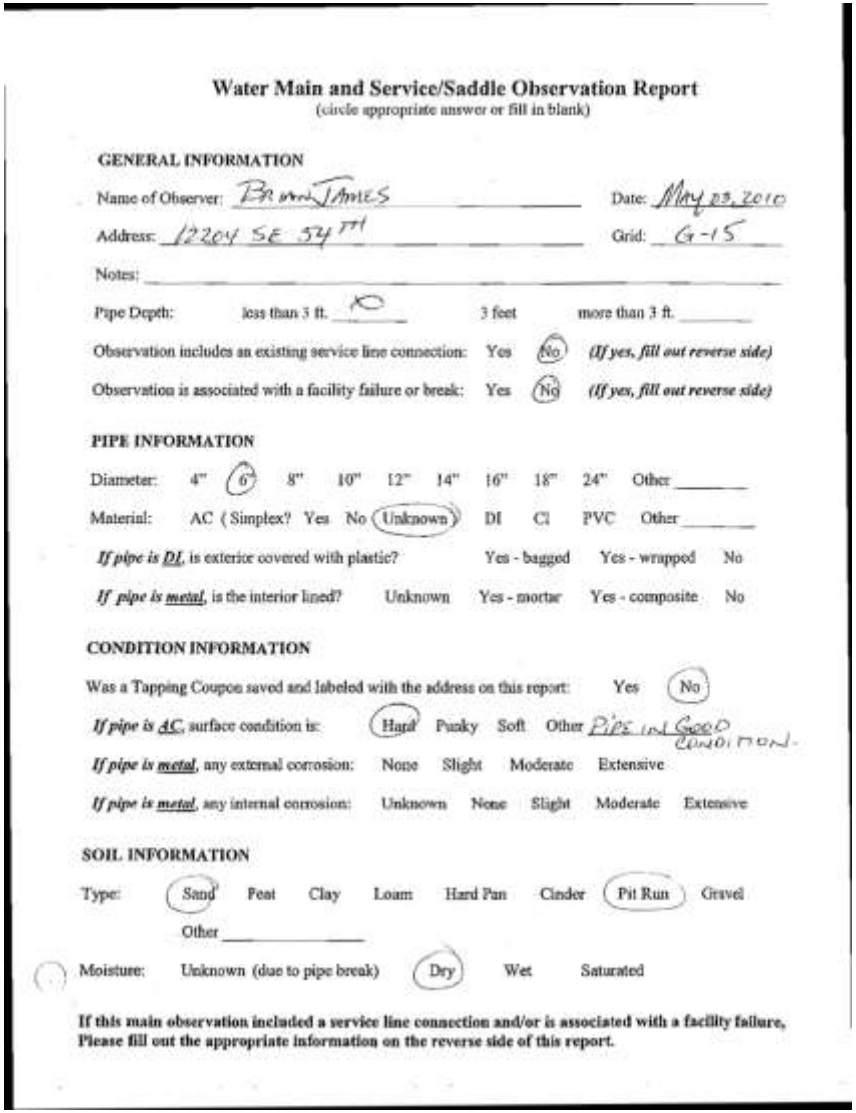
Asset Management Ten Core Processes



Water Utility Condition Assessment

- Field observation (e.g., main observation reports)
- Failure tracking
- Laboratory testing

Condition Assessment – Staff Observations



Water Main and Service/Saddle Observation Report
(circle appropriate answer or fill in blank)

GENERAL INFORMATION

Name of Observer: BRIAN JAMES Date: MAY 03, 2010

Address: 12204 SE 54TH Grid: G-15

Notes: _____

Pipe Depth: less than 3 ft. 0 3 feet more than 3 ft. _____

Observation includes an existing service line connection: Yes (No) *(If yes, fill out reverse side)*

Observation is associated with a facility failure or break: Yes (No) *(If yes, fill out reverse side)*

PIPE INFORMATION

Diameter: 4" (6") 8" 10" 12" 14" 16" 18" 24" Other _____

Material: AC (Simplex? Yes No (Unknown) DI CI PVC Other _____

If pipe is DI, is exterior covered with plastic? Yes - bagged Yes - wrapped No

If pipe is metal, is the interior lined? Unknown Yes - mortar Yes - composite No

CONDITION INFORMATION

Was a Tapping Coupon saved and labeled with the address on this report: Yes (No)

If pipe is AC, surface condition is: (Hard) Punky Soft Other PIPE IN GOOD CONDITION.

If pipe is metal, any external corrosion: None Slight Moderate Extensive

If pipe is metal, any internal corrosion: Unknown None Slight Moderate Extensive

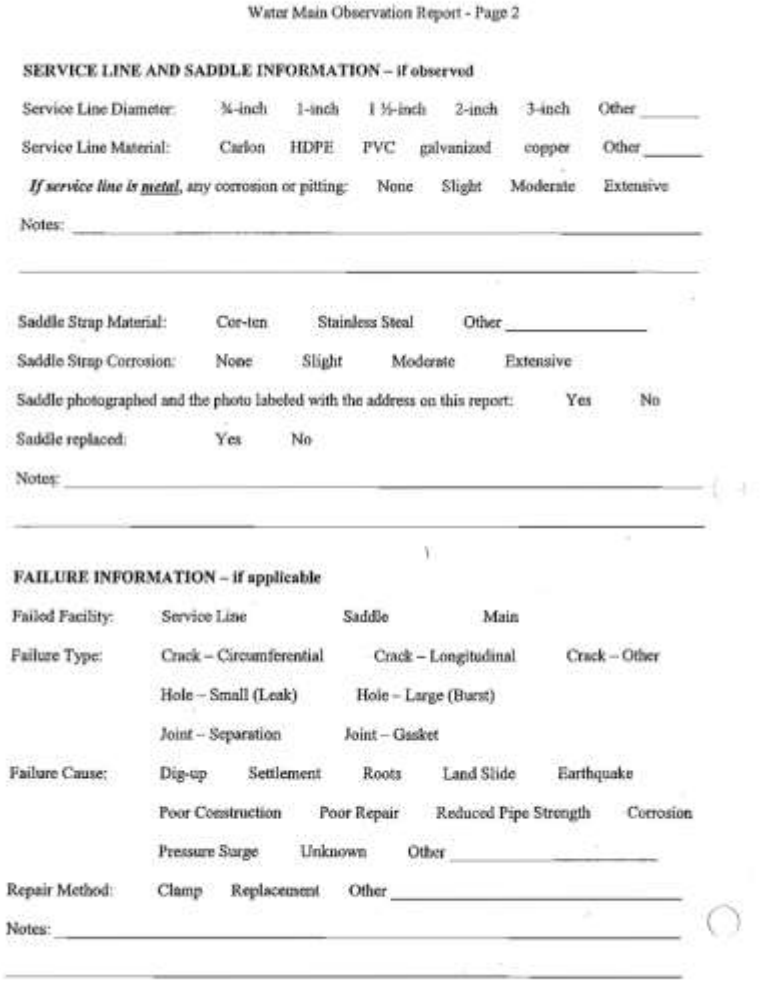
SOIL INFORMATION

Type: (Sand) Peat Clay Loam Hard Pan Cinder (Pit Run) Gravel

Other _____

Moisture: Unknown (due to pipe break) (Dry) Wet Saturated

If this main observation included a service line connection and/or is associated with a facility failure, Please fill out the appropriate information on the reverse side of this report.



Water Main Observation Report - Page 2

SERVICE LINE AND SADDLE INFORMATION – if observed

Service Line Diameter: ¾-inch 1-inch 1 ½-inch 2-inch 3-inch Other _____

Service Line Material: Carlon HDPE PVC galvanized copper Other _____

If service line is metal, any corrosion or pitting: None Slight Moderate Extensive

Notes: _____

Saddle Strap Material: Cor-ten Stainless Steal Other _____

Saddle Strap Corrosion: None Slight Moderate Extensive

Saddle photographed and the photo labeled with the address on this report: Yes No

Saddle replaced: Yes No

Notes: _____

FAILURE INFORMATION – if applicable

Failed Facility: Service Line Saddle Main

Failure Type: Crack – Circumferential Crack – Longitudinal Crack – Other

Hole – Small (Leak) Hole – Large (Burst)

Joint – Separation Joint – Gasket

Failure Cause: Dig-up Settlement Roots Land Slide Earthquake

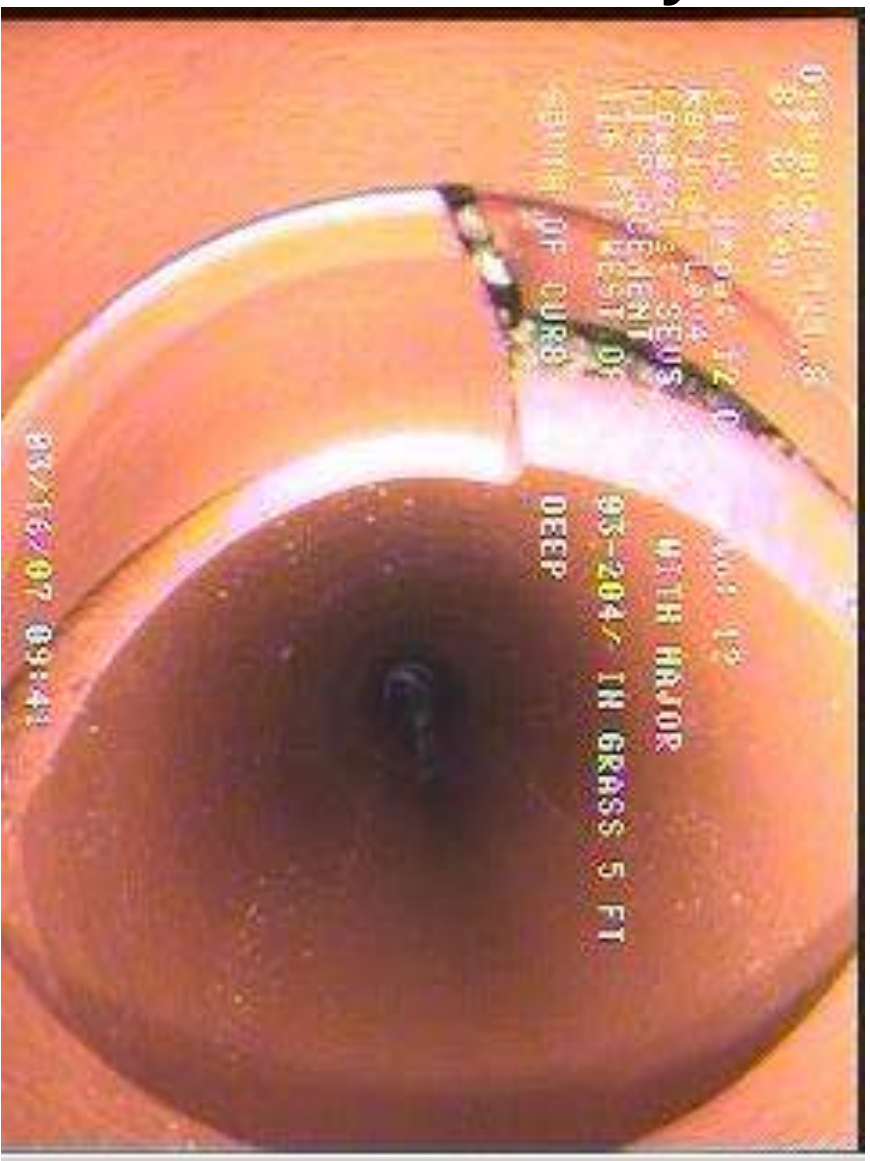
Poor Construction Poor Repair Reduced Pipe Strength Corrosion

Pressure Surge Unknown Other _____

Repair Method: Clamp Replacement Other _____

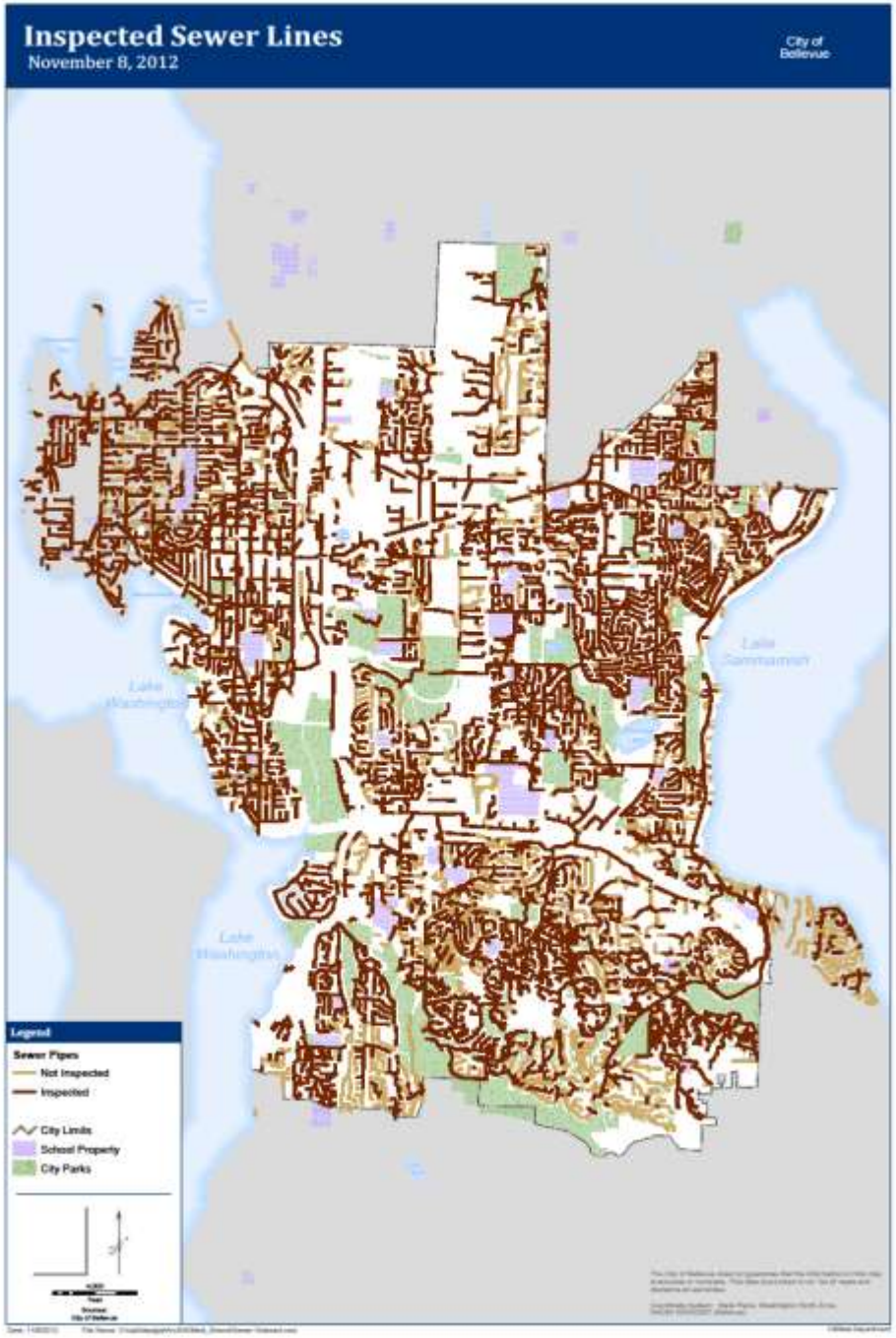
Notes: _____

Condition Assessment: Wastewater Utility Assets



Wastewater System CCTV Condition Assessment

- Approximately 60 miles per year
  - Special needs
  - Programmatic
- Pipelines videoed on 5, 10 or 20 year intervals based on pipeline risk (failure probability multiplied by failure consequences)



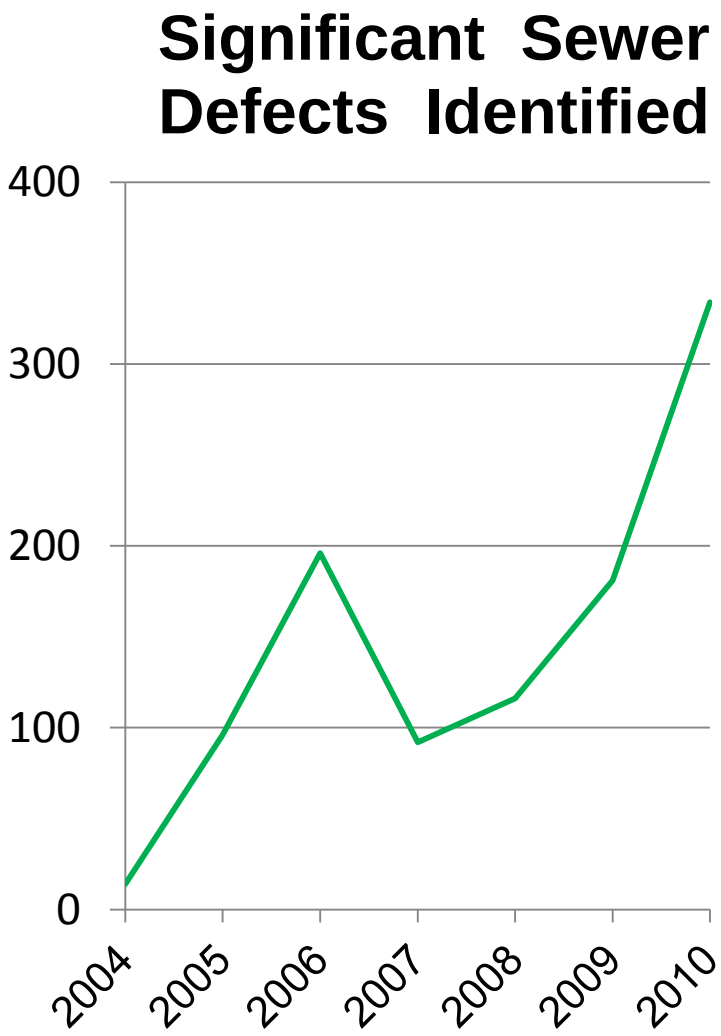
Sewer Video Plan Approach

	A	B	C	D	E	F	G	H	I
1	AssetNum	Basin	VideoCategor	LastVideo	VideoDue	Diameter	Material	InstallDate	
2	196937	4	Collection	6/15/2004	2024	8	CON	1959	
3	196938	4	Collection	9/17/2003	2023	8	CON	1959	
4	196939	4	Collection	7/1/2004	2024	8	CON	1959	
5	196940	4	Collection	9/17/2003	2023	8	CON	1959	
6	196941	4	High Risk	6/11/2004	2014	8	CON	1950	
7	196942	4	Collection	5/7/2008	2028	8	CON	1960	
8	196943	4	Collection	5/9/2008	2028	8	CON	1959	
9	196944	4	Collection	10/7/1997	2017	8	CON	1959	
10	196945	4	Collection	11/18/2013	2033	8	CON	1959	
11	196946	4	Collection	5/7/2008	2028	8	CON	1960	
12	196947	4	High Risk	10/29/2009	2019	8	CON	1959	
13	196948	4	Collection	9/30/2008	2028	6	CON	1950	
14	196949	4	Collection	6/6/2008	2028	8	CON	1959	
15	196950	4	High Risk	3/15/2006	2016	8	CON	1950	
16	196951	4	High Risk	3/18/2006	2016	8	CON	1950	
17	196952	4	Collection	5/13/2004	2024	8	CON	1959	
18	196953	4	High Risk	8/19/2011	2021	8	CON	1950	
19	196954	4	Collection	10/6/1997	2017	8	CON	1959	
20	196955	4	Collection	10/15/1997	2017	8	CON	1961	
21	196956	4	Collection	9/20/2005	2025	8	CI	1965	
22	196957	4	Collection	6/13/2007	2027	8	CON	1959	
23	196958	4	Collection	5/13/2004	2024	8	CON	1959	
24	196959	4	Collection	6/17/2004	2024	8	CON	1959	
25	196960	4	Collection	9/17/2003	2023	8	CON	1959	
26	196961	4	Collection	9/22/2003	2023	8	CON	1959	
27	196962	4	Collection	5/9/2008	2028	8	CON	1959	
28	196963	4	Collection	6/18/2004	2024	8	CON	1959	
29	196964	4	Collection	9/30/2003	2023	12	PVC	1985	
30	196965	4	Collection	3/10/2004	2024	8	PVC	1970	
31	196966	4	Collection	3/10/2004	2024	8	PVC	1970	
32	196967	4	Collection	10/11/2007	2027	8	CON	1959	
33	196968	4	Collection		2014	6	CON	1959	
34	196969	4	Collection	5/6/2002	2022	8	CON	1959	
35	196970	4	Collection	10/2/1997	2017	8	CON	1961	
36	196971	4	Collection	10/2/1997	2017	8	CON	1959	
37	196972	4	Collection	9/17/2003	2023	8	CON	1959	
38	196973	4	High Risk	11/1/2013	2023	8	VC	1963	

Next_Video_Year

Ready

Sewer Death Spiral

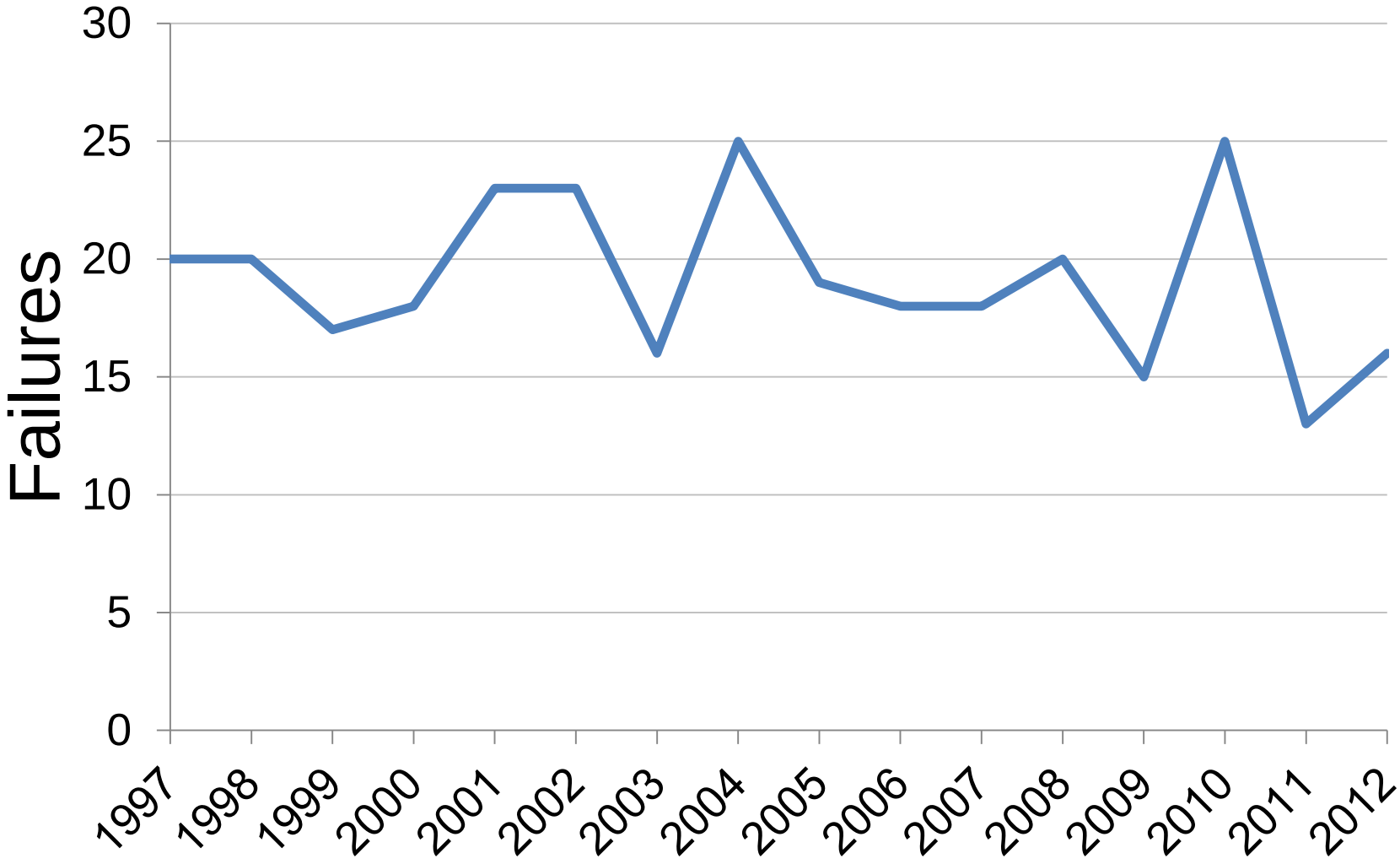


Condition Assessment: Stormwater Utility

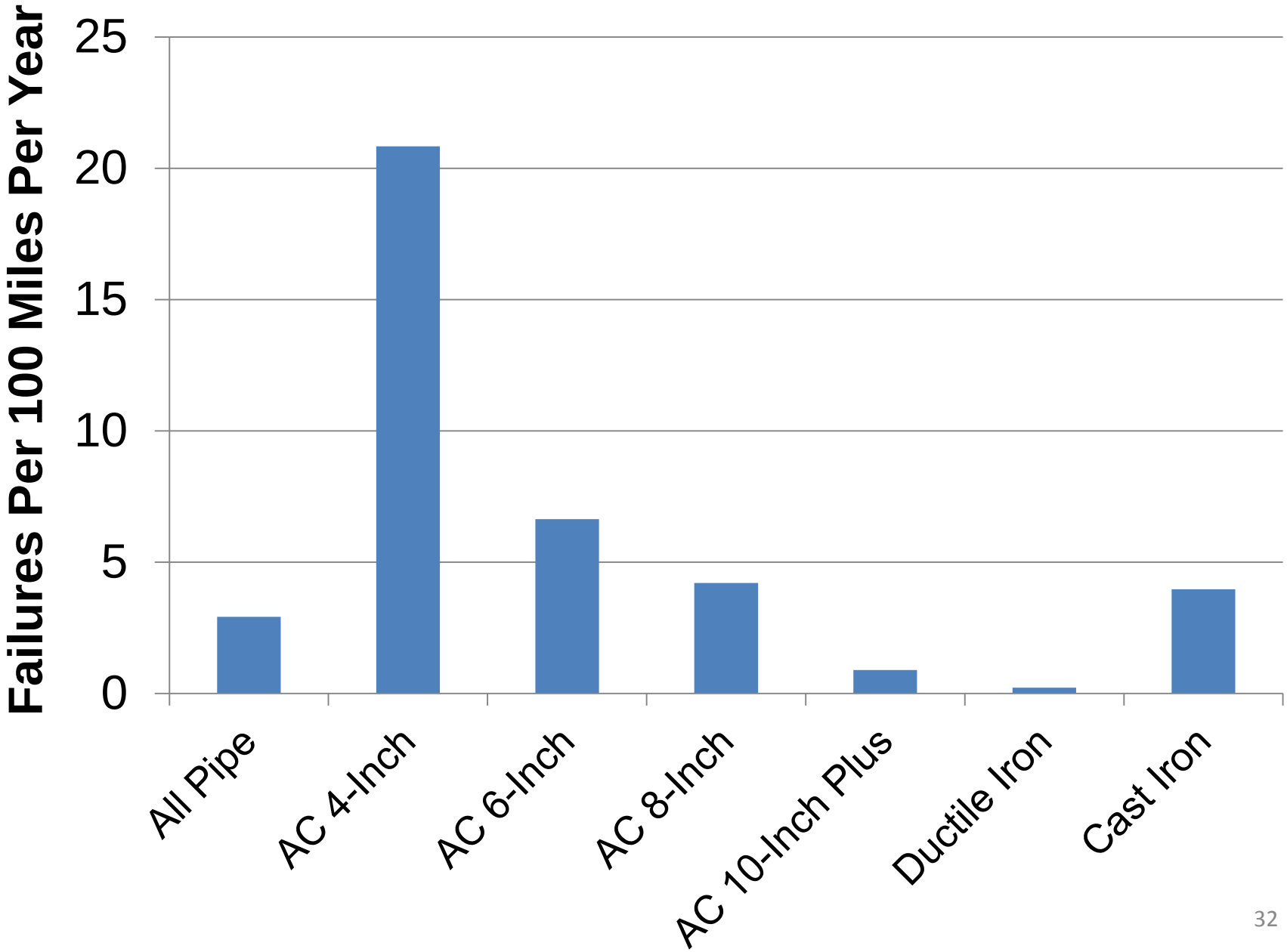
Program Update: Stormwater System

- CCTV Pipeline Condition Assessment
- Culvert Inventory and Condition Assessment
- Storm Pipe Data Collection

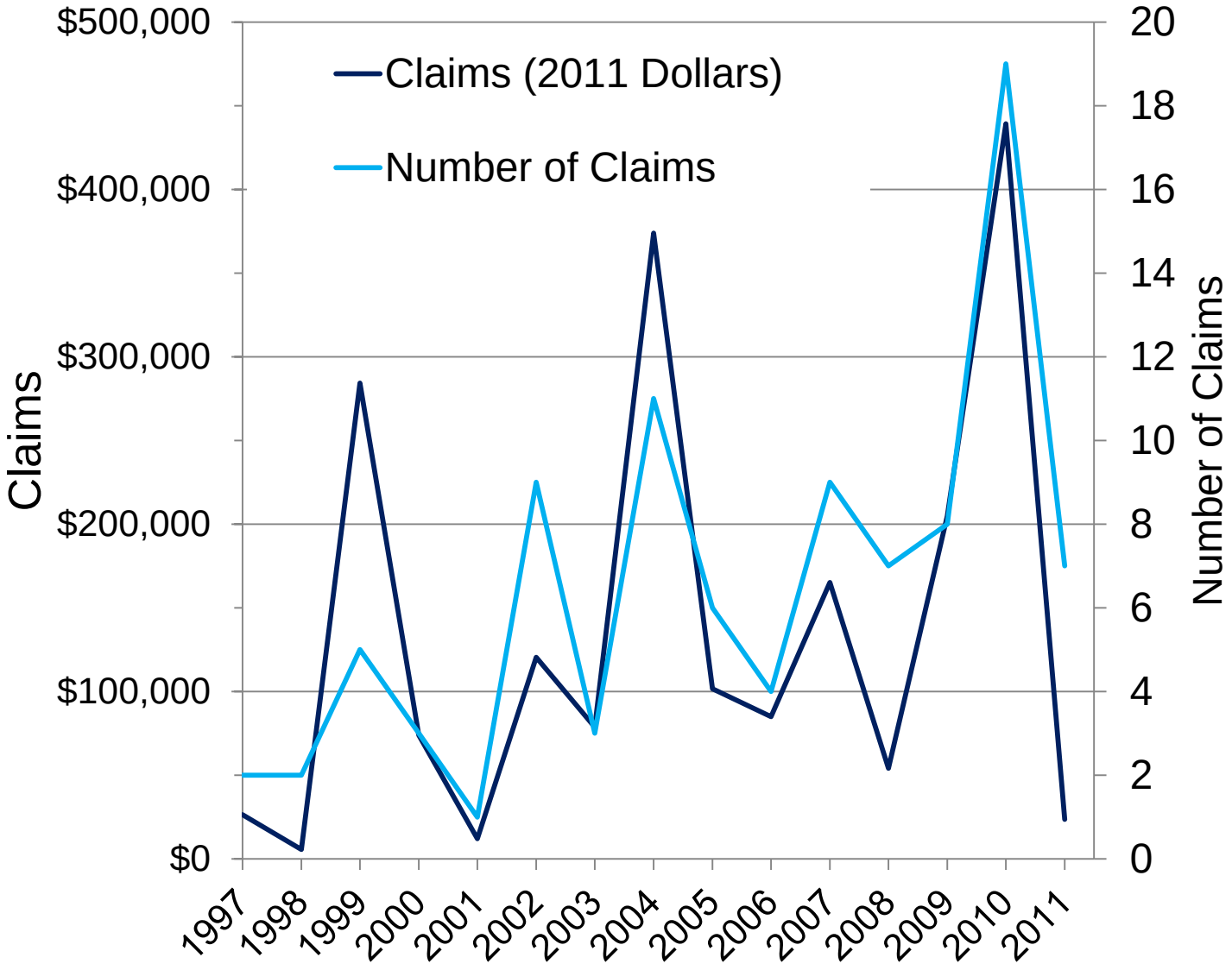
Watermain Failures



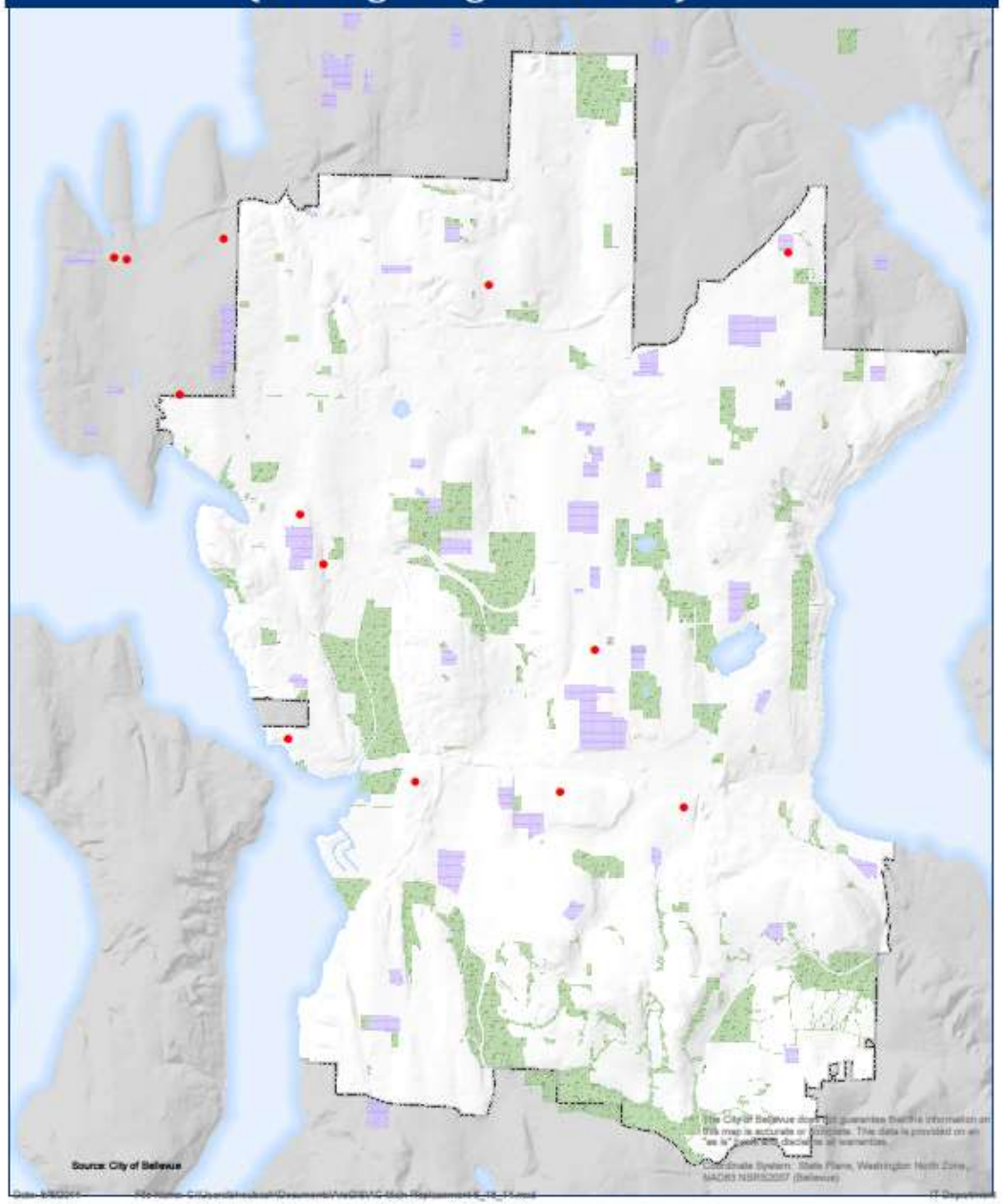
2010 - 2012 Watermain Failure Rates



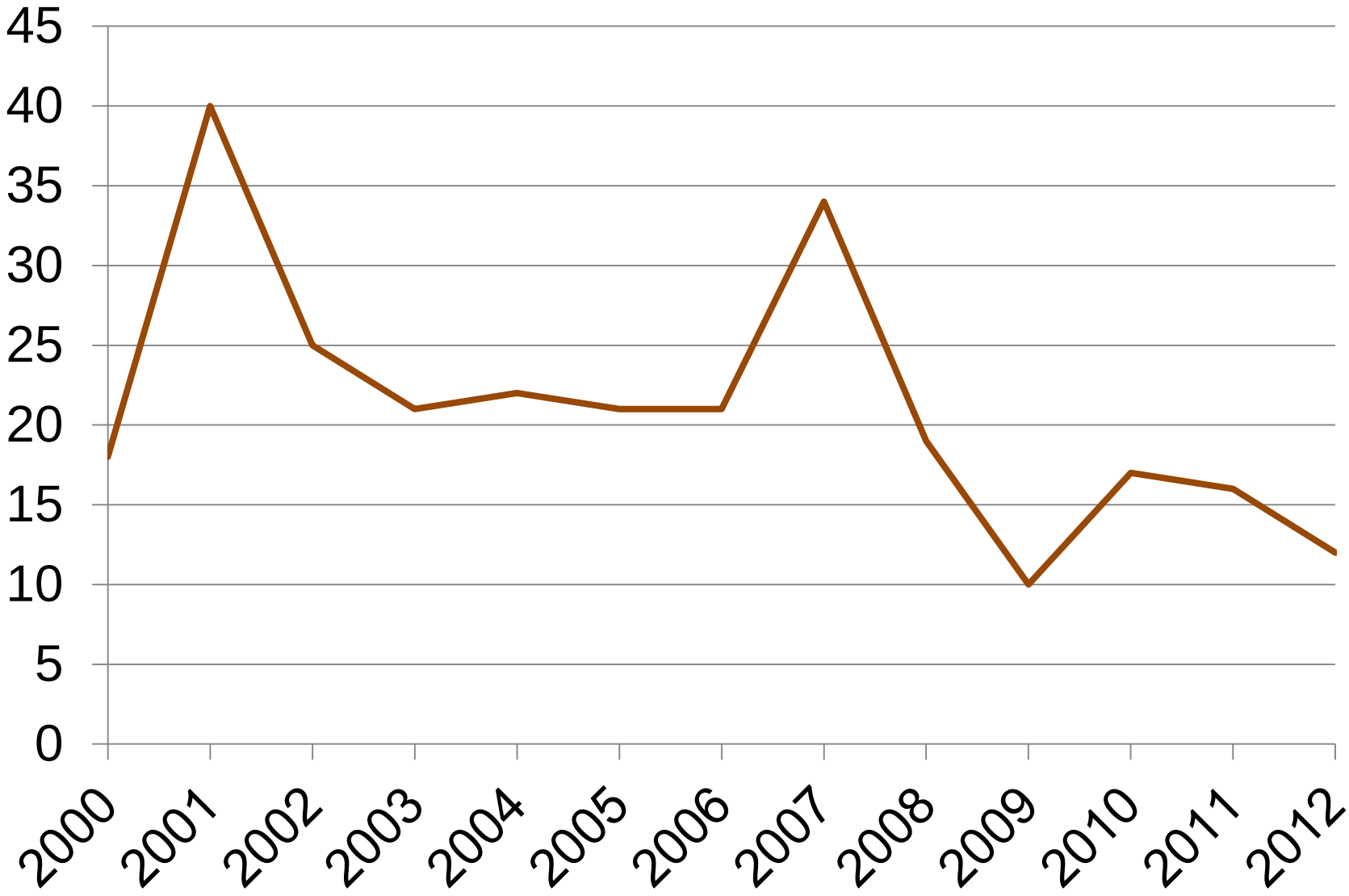
Water Utility Claims



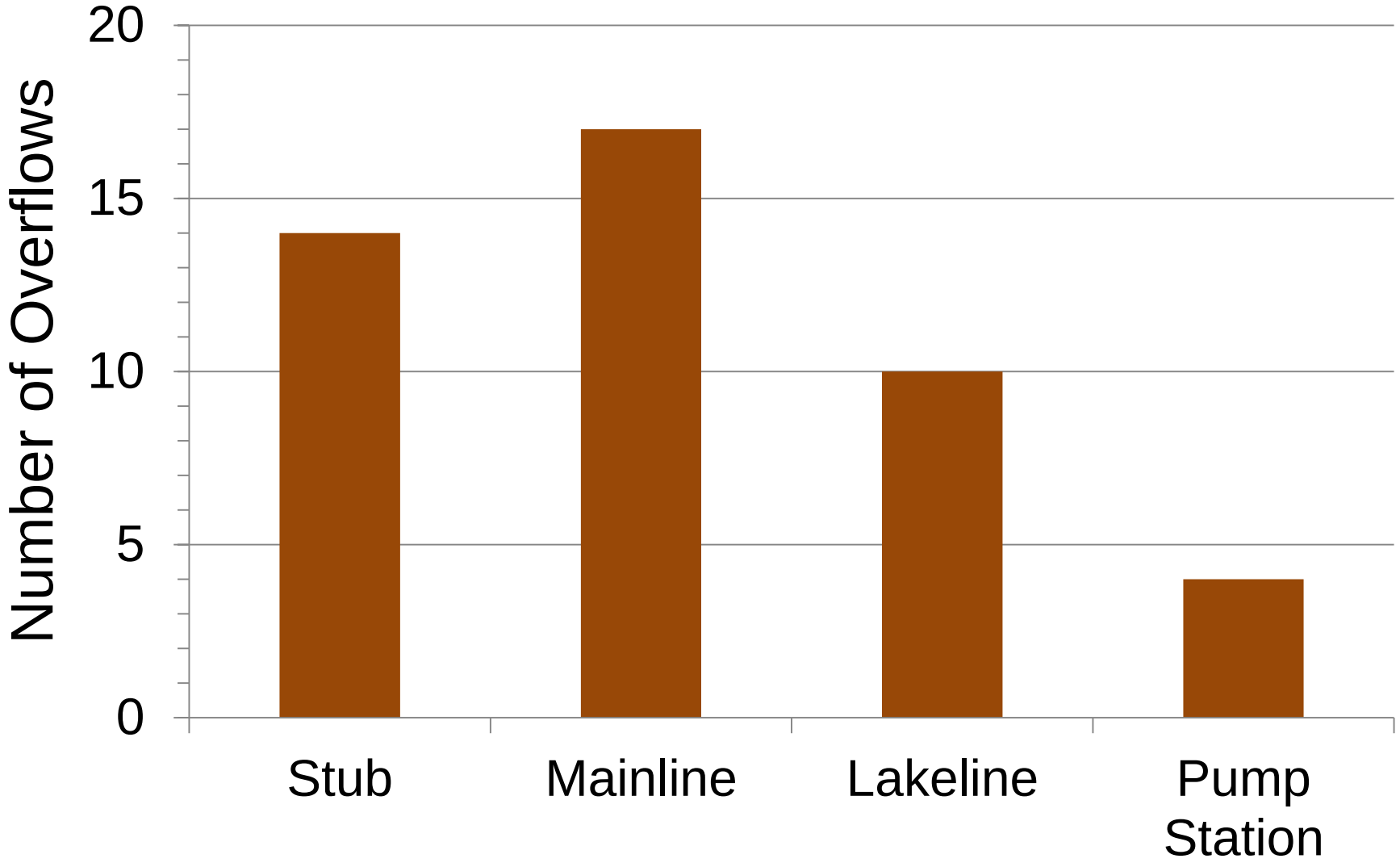
2014 Watermain Failures (Through August 7, 2014)



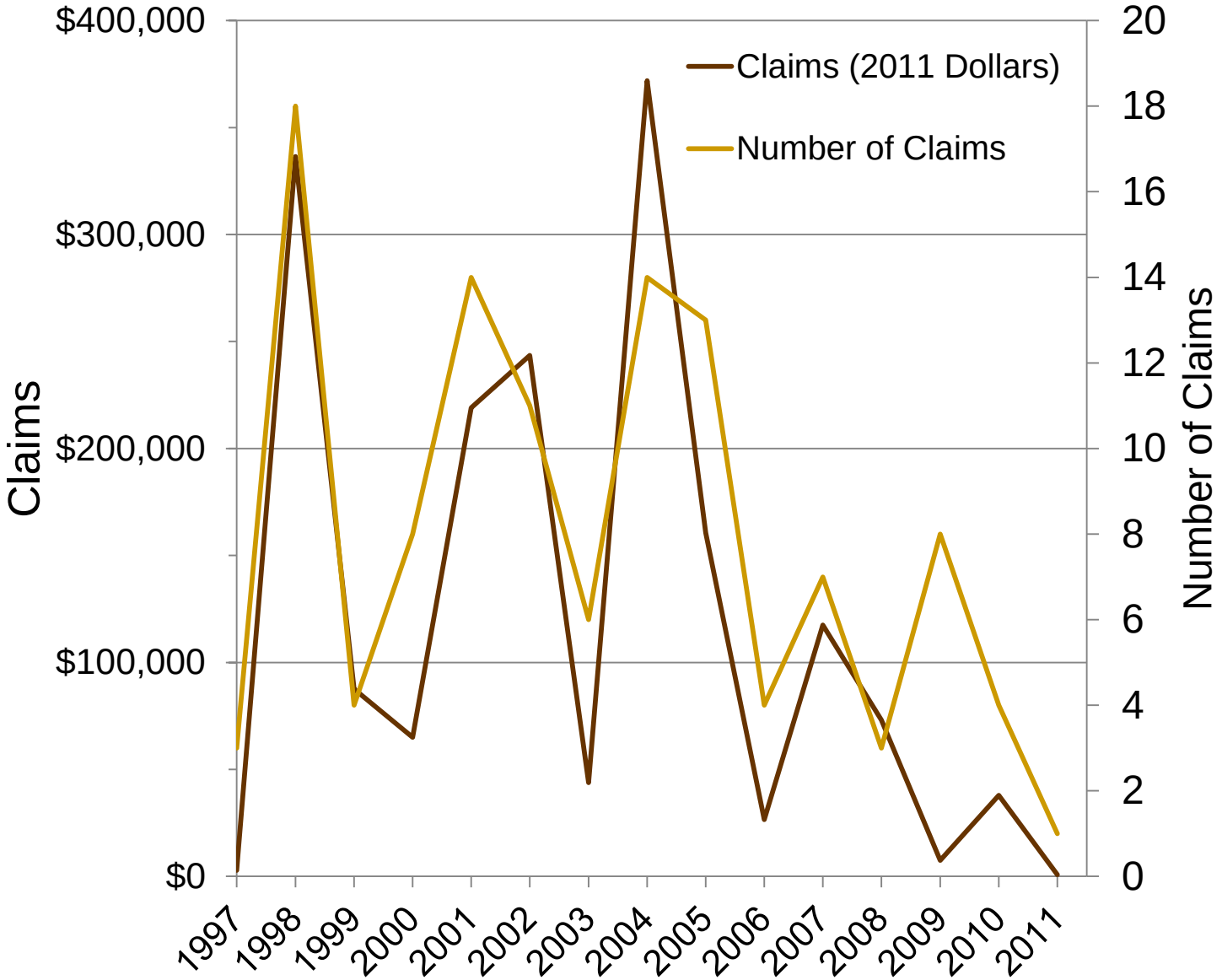
Wastewater Overflows



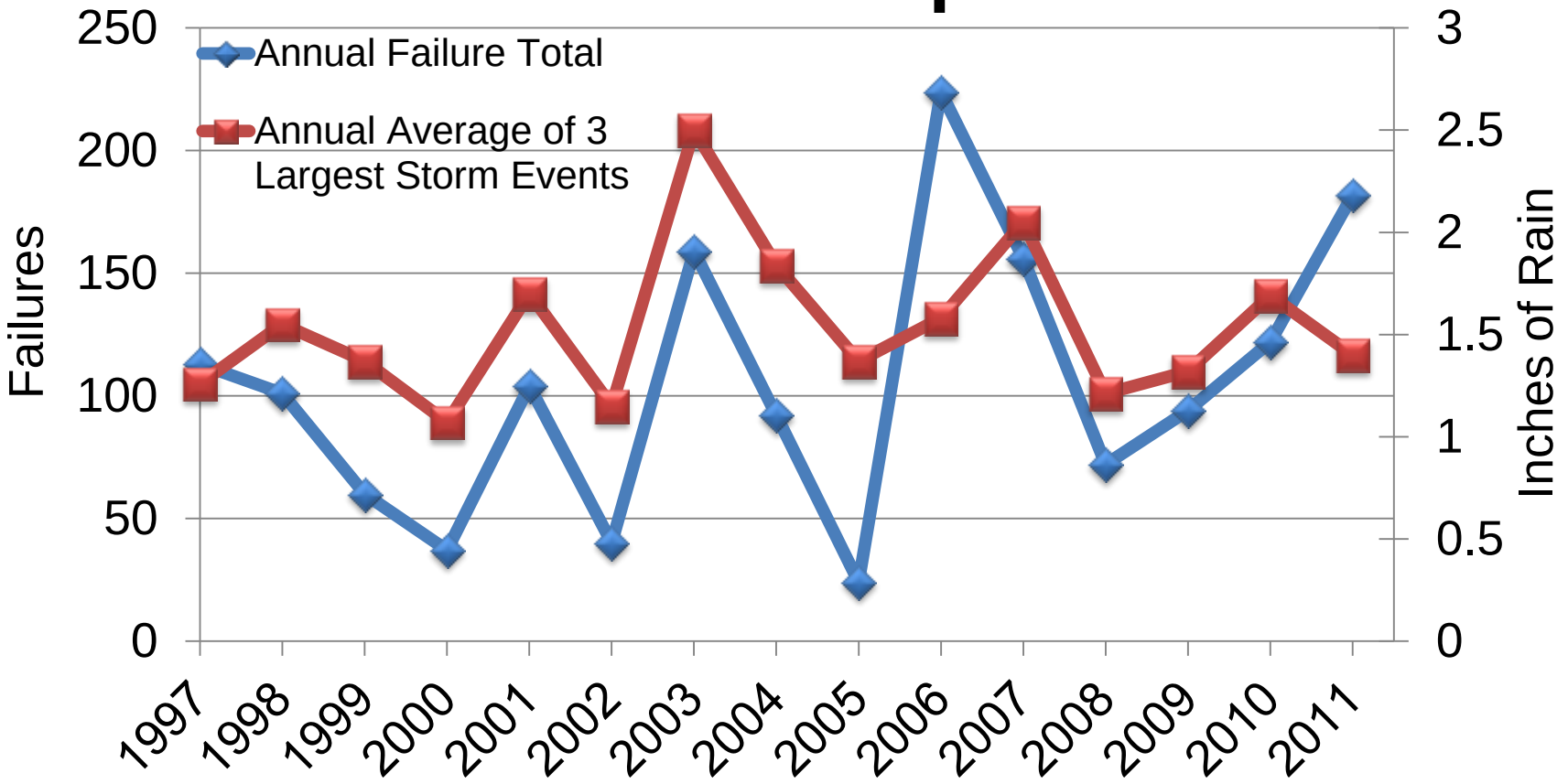
Asset Responsible for Overflow (2010 - 2012)



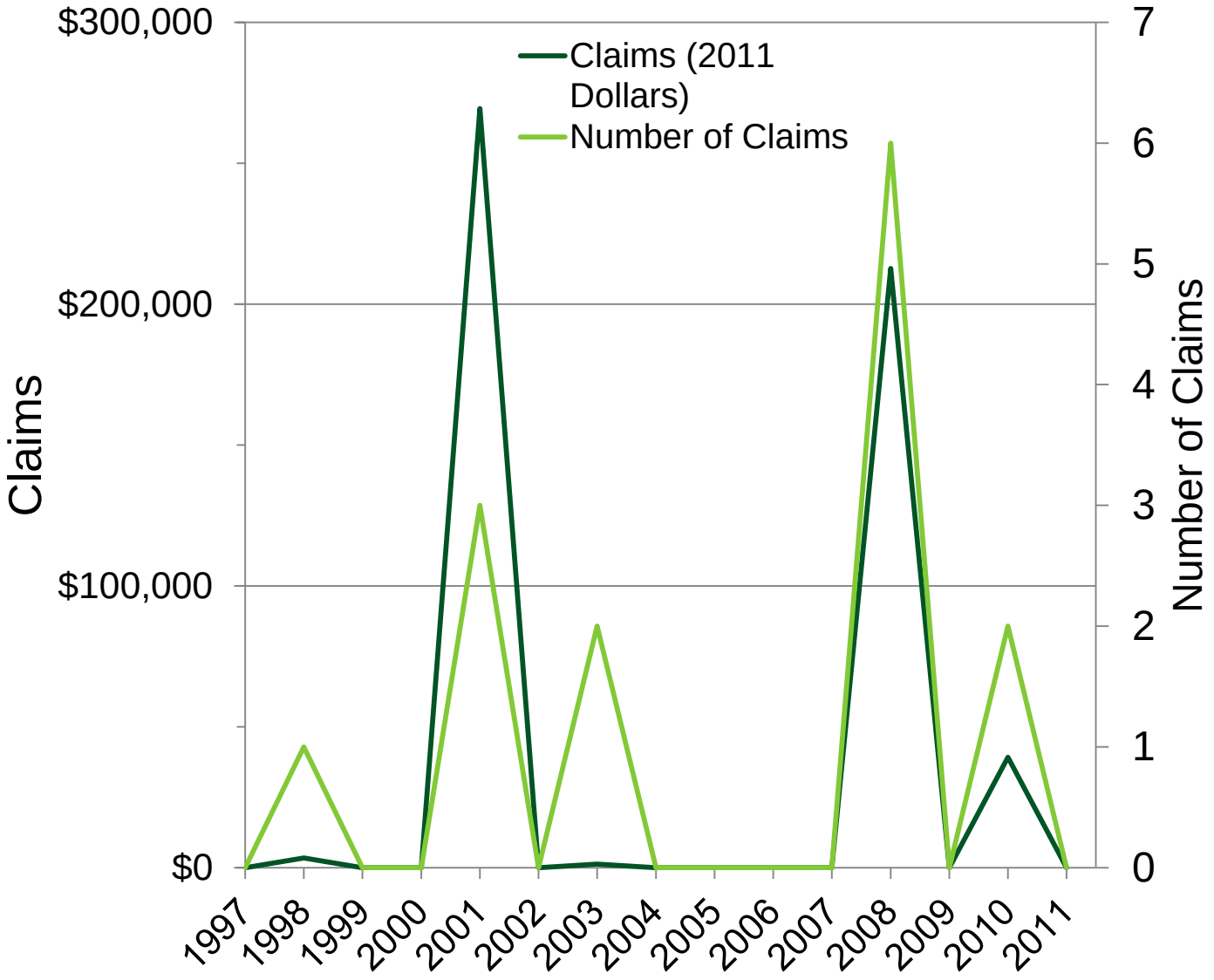
Wastewater Utility Claims



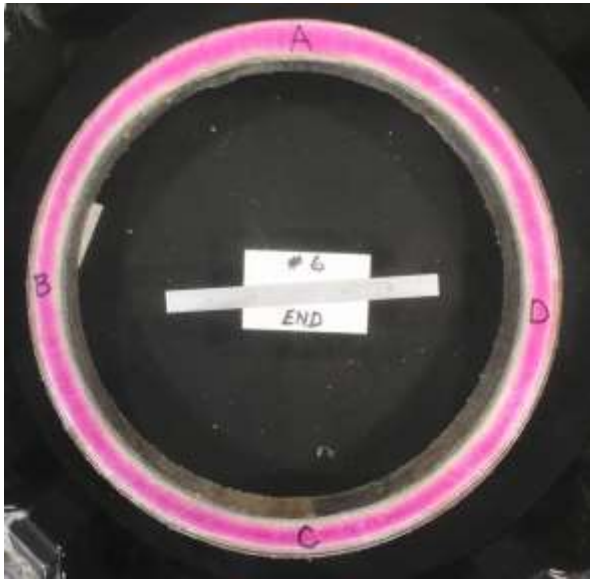
Total Annual Failures vs. Storm Precipitation Average of 3 Largest Storm Events per Year

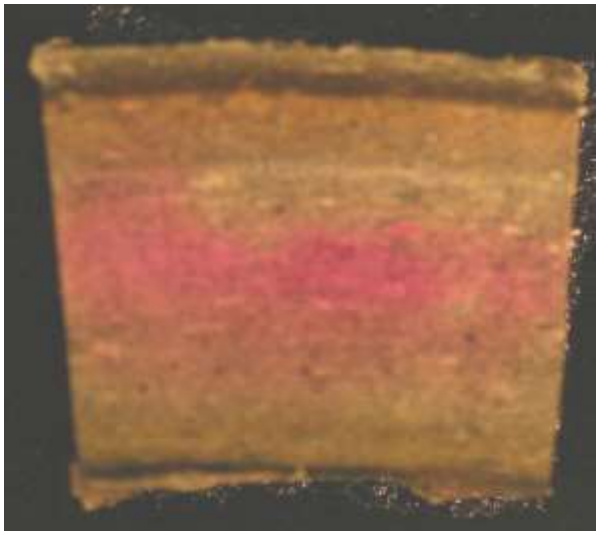


Stormwater Utility Claims



AC Watermain laboratory testing





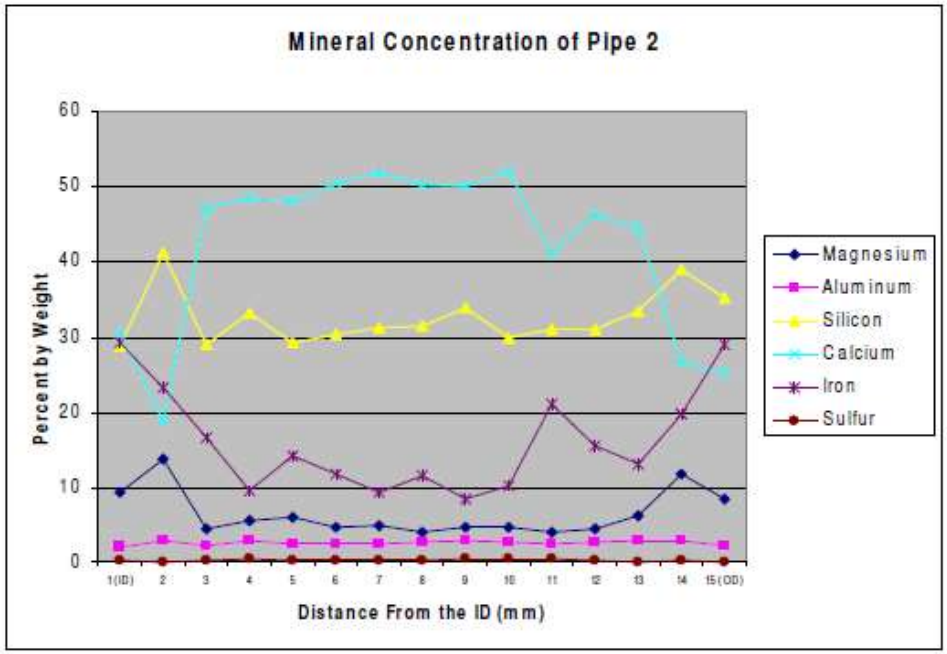
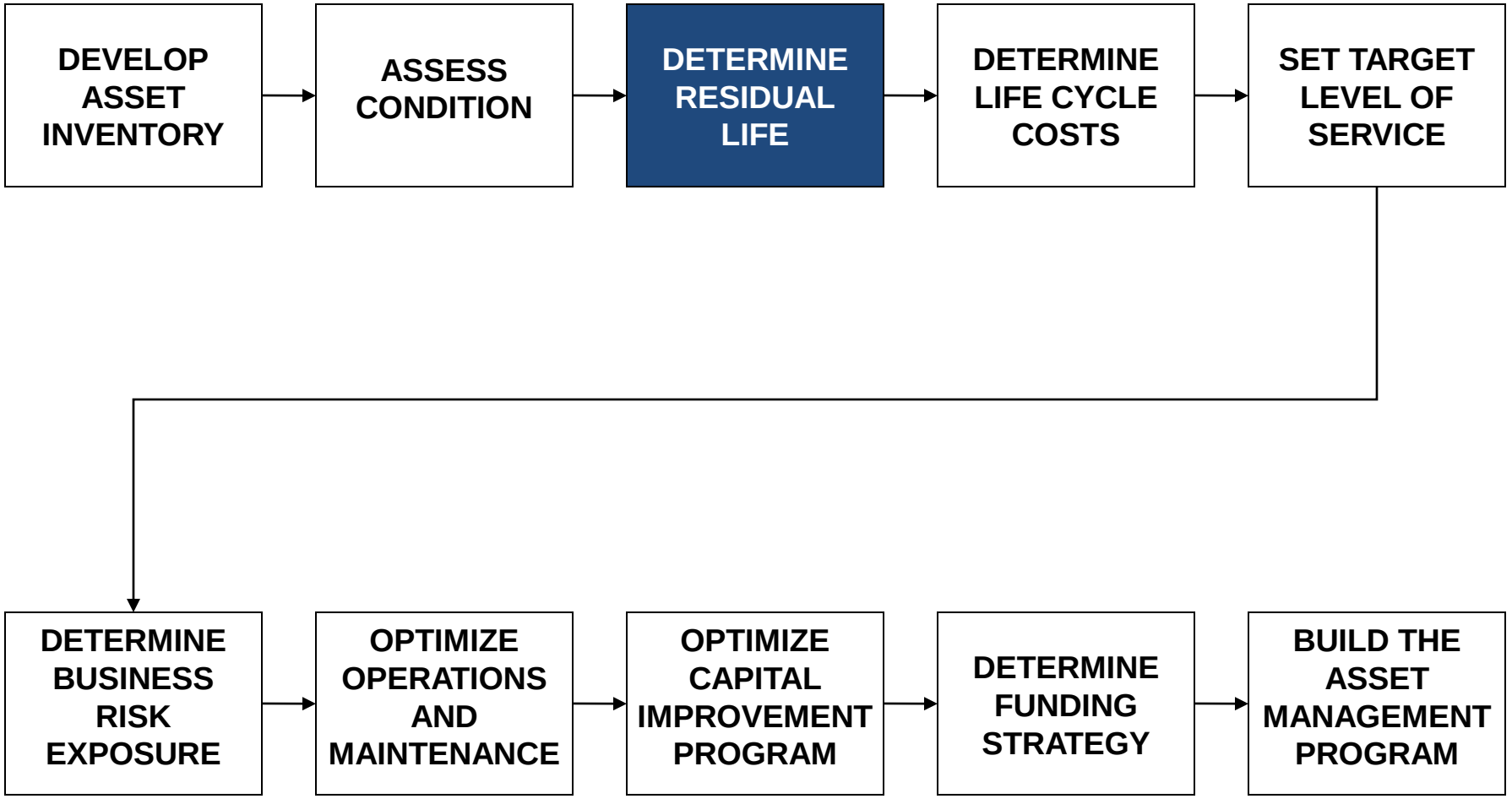


Fig. 15. Elemental Distribution through Cross Section of Pipe #2

AC Watermain Laboratory Testing (cont)

Asset Management Ten Core Processes



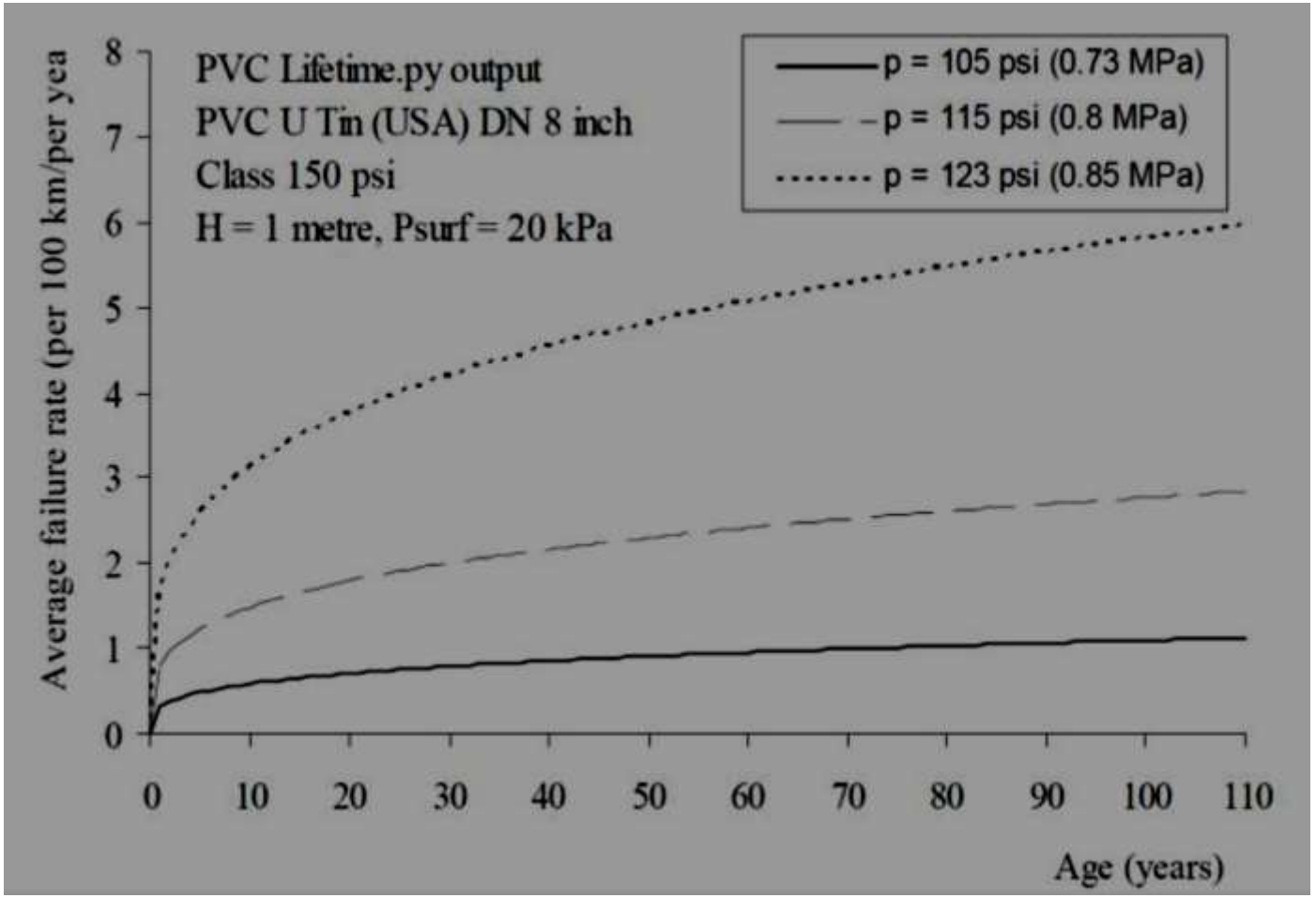
Remaining Life ~~Determination~~ Estimation

- Condition Assessment
  - Observation
  - Testing
  - Failure tracking
- Industry Norms
- Similar Assets

Four Major Failure Modes (EPA)

- Capacity
- Level of Service
- Mortality
- Efficiency

EPA (not really) Estimated Mileage



EPA (not really) Estimated Mileage (cont)

Table 1: Investigations of Gray and Ductile Iron Pipes in Non-Aggressive Soils

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate (in./yr.)	Years to Penetration*
As-manufactured (Standard Shop Coating)	43	0.00067	373
Polyethylene Encased	12	0.0000	∞

Table 2: Investigations of Gray and Ductile Iron Pipes in Corrosive Soils

Pipe Condition	Number of Specimens	Mean Deepest Pitting Rate (in./yr.)	Years to Penetration*
Sand Blasted (annealing oxide layer removed)	102	0.025	10
Bare (uncoated)	22	0.0151	17
As-manufactured (Standard Shop Coating)	103	0.0105	24
Polyethylene Encased	151	0.00045	556

But Your Mileage May Vary…

Table 5.3
Estimated annual failure rates for PVC pipes

Water authority	Length of PVC pipe (km)	No. of recorded failures	Recording period	Av failure rate (100km/y)	Av failure rate (100miles/y)
EBMUD	513.4	21	1996–2002	0.6	1.0
Des Moines Water Works*	241.263	0	N/A	0.0	0.0
United Water Toms River	336.1	8	2003–2004	1.7	2.7
Louisville Water Company	1,012.3	390	1976-2004	1.4	2.3
City of Calgary Waterworks	1,699.9	17	1991–2000	0.1	0.2
City of Richmond	157.9	4	2000-2004	0.5	0.8
City of Ottawa	515.5	16	1992–2002	0.3	0.5
Epcor	1,098.5	71	1977–2004	0.2	0.5
City West Water	544.7	206	1996–2003	5.4	8.7
Hunter Water	626.1	323	1992–2003	4.3	6.9
South West Water	250.8	Unknown	Unknown	1.5	2.4
Yarra Valley Water	800.6	384	1995–2003	5.3	8.5
South Australia Water	587.7	Unknown	Unknown	Unknown	Unknown
Ipswich Water	250.6	1	2000–2001	0.2	0.3
South East Water	1,778.2	844	1996–2002	6.8	10.9
Gosford Water	24.4	3	2000–2001	6.1	9.8
Sydney Water	1,262.0	134	1997–2002	1.8	2.9

* Does not include failures for joints and/or external damage.

Your Mileage May Vary (Part 2)…

Table 1.4
Estimated time intervals (years) for full pipe wall penetration in DI mains

Potential corrosivity states	Pressure (class 350)	Thickness class: Min thickness (class 50)	(class 52)	Max thickness (class 56)
Pipe diameter: 6" (150 mm)				
Very low (VL)	125–190	125–190	455–540	1120–1240
Low (L)	30–42	30–42	270–315	805–880
Moderate (M)	11–14	11–14	23–52	335–415
High (H)	5–6	5–6	7.5–9.5	25–61
Very high (VH)	3–3.5	3–3.5	4–4.5	6.5–9
Pipe diameter: 8" (200 mm)				
Very low (VL)	125–190	235–305	570–655	1240–1350
Low (L)	30–42	105–125	355–410	895–975
Moderate (M)	11–14	13–24	46–83	395–485
High (H)	5–6	6–7	8.5–13	54–97
Very high (VH)	3–3.5	3.5	4.5–5	7.5–13
Pipe diameter: 10" (250 mm)				
Very low (VL)	180–250	345–420	680–770	1350–1470
Low (L)	60–78	185–220	445–505	980–1070
Moderate (M)	12–18	17–36	105–150	455–550
High (H)	5.5–6.5	6.5–8	10–21	94–145
Very high (VH)	3–3.5	3.5–4	4.5–5.5	8–18
Pipe diameter: 12" (300 mm)				
Very low (VL)	290–365	455–540	790–885	1460–1590
Low (L)	145–175	270–315	535–600	1070–1170
Moderate (M)	15–30	23–52	160–215	515–615
High (H)	6.5–7.5	7.5–9.5	12–29	135–190
Very high (VH)	3.5–4	4–4.5	5–6	9–24

1940's – 1960's: The Glory Days of Asbestos Cement Pipe …

Will History Repeat Itself?

Iron = Strength.

Smart athletes know that pumping iron builds strength. And smart communities know that successful infrastructure projects begin with the strength of ductile iron pipe.

Smart®Certified because it's made from recycled and recyclable materials and uses less energy in pumping, ductile iron pipe is the superior choice over PVC—whose production creates toxins that have caused some cities and corporations to ban it.

But ductile iron isn't just strong on the environment, it's the strongest pipe material on the market—ten times stronger than PVC. Reliable, easy to install and without the laying and tapping headaches associated with PVC. No wonder thousands of communities choose ductile iron.
It works out everytime.

Iron Pipe. It's What America Was Built On

DUCTILE IRON PIPE
RESEARCH ASSOCIATION
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PVC PIPE: THE SOLUTION FOR AMERICA'S UNDERGROUND INFRASTRUCTURE

Making Muncipal Water and Sewer Systems Safe, Sustainable and Corrosion-Free for Over 60 Years

Two Million Miles of Unsurpassed Reliability

- Force Mains
- Reclaimed Water
- Sanitary Sewer
- Storm Water
- Trenchless
- Water

Available in Sizes
4" – 60"

Corrosion is not sustainable. It costs U.S. water and sewer systems more than $50.7 billion annually in repairs, replacements and lost water. PVC pipe is a cost-effective and durable investment in your community's future.

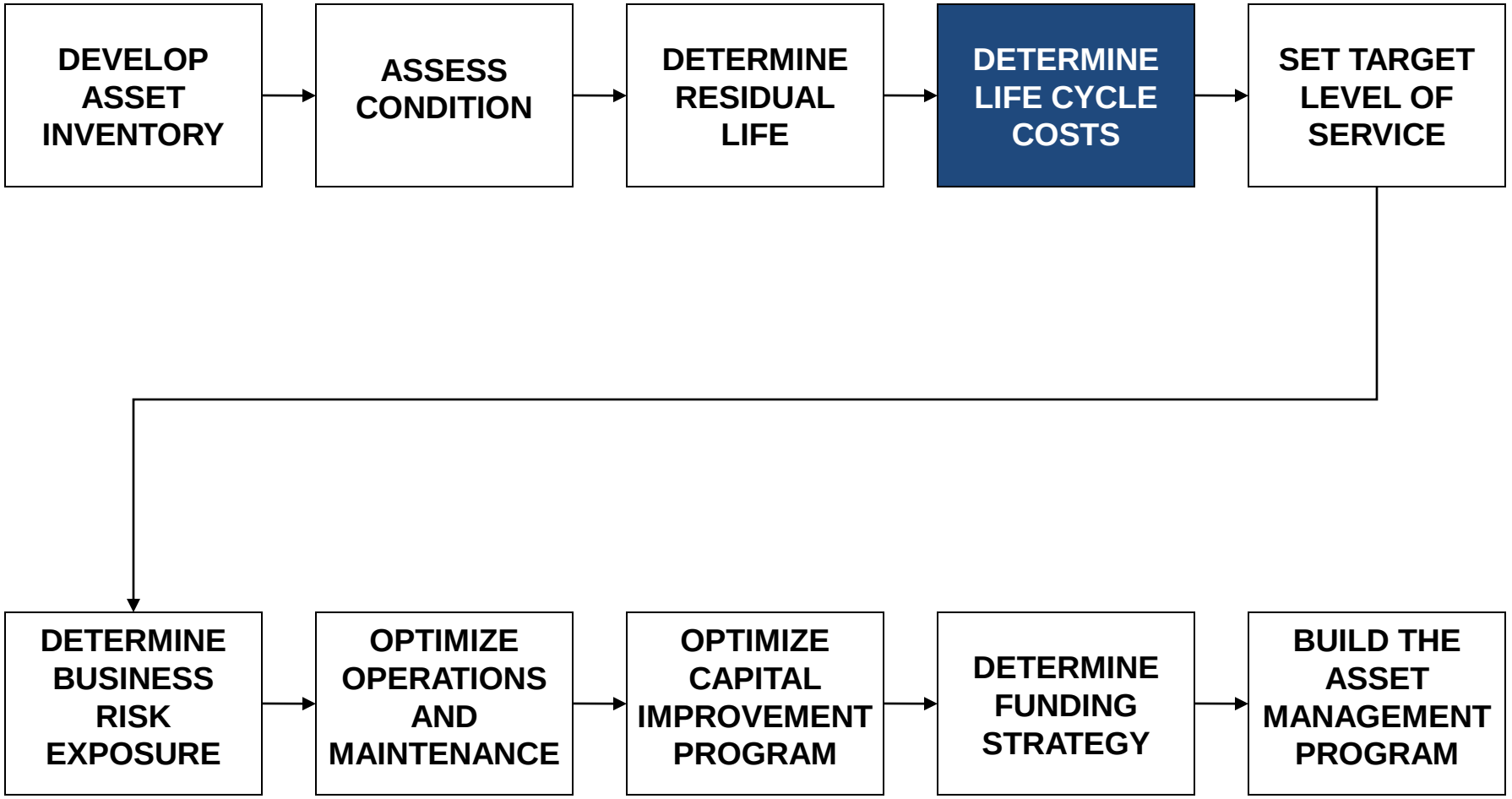
For information on design and installation, visit the PVC Pipe Association's new web site at **www.uni-bell.org.**

PVCPIPE association

True strength and sustainability begin with corrosion resistance.

UNI-BELL PVC PIPE ASSOCIATION | 2711 LBJ FREEWAY, SUITE 1000 | DALLAS, TX 75234
972.243.3902 | FX: 972.243.3907

Asset Management Ten Core Processes



~~Triple~~ Quadruple Bottom Line

- Economic
  - Capital
  - Operations and Maintenance
- Environmental
- Social
- Political

(costs, benefits and risk costs)

Identifying the Most Cost-Effective Strategies

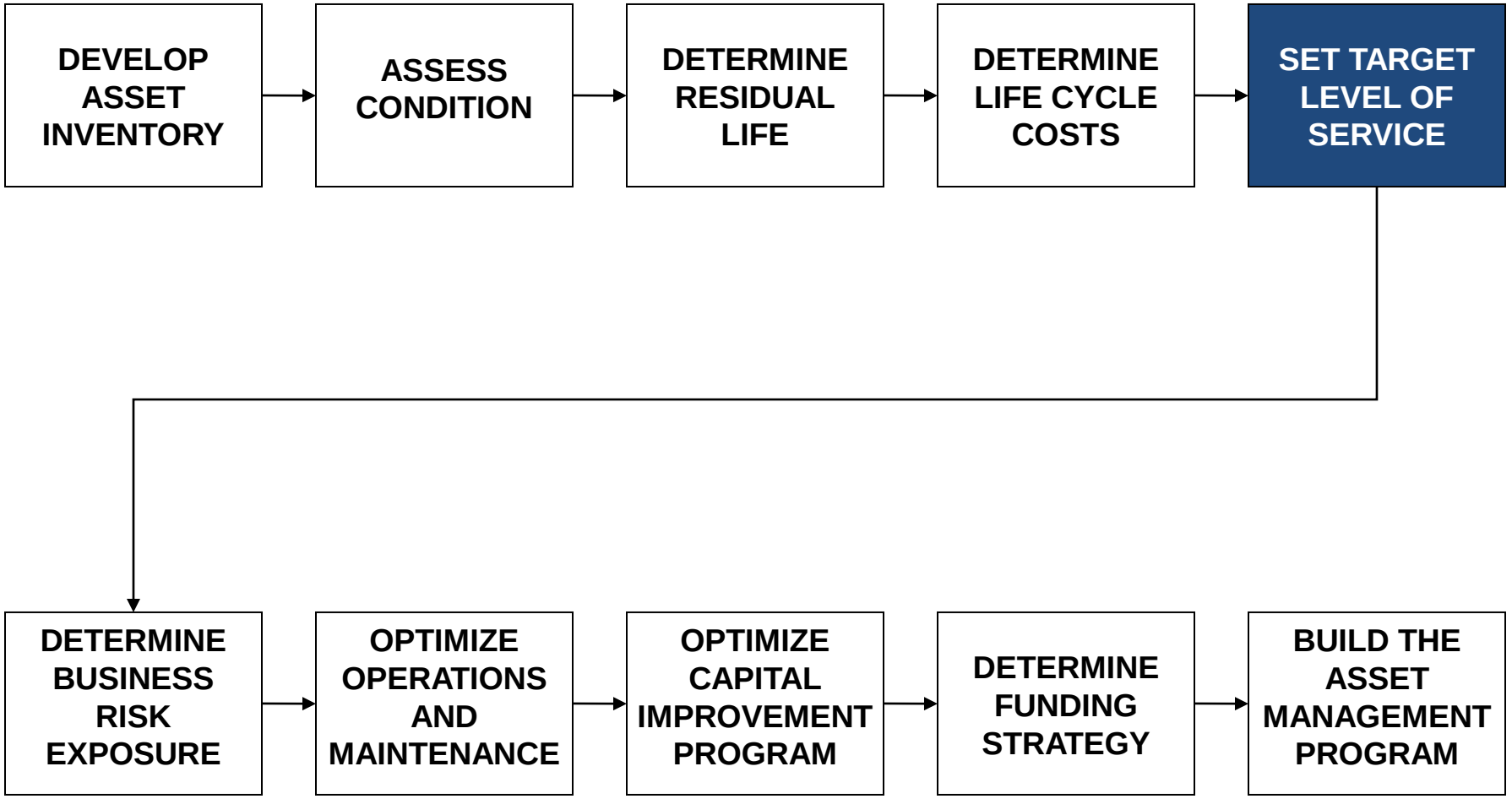
Wilburton Area Wastewater Capacity Improvements
Summary of Life Cycle Costs

	Alt 1 – Upsize Mains	Alternative 1A – Upsize Mains, Use Existing SE 8th St Piles	Alternative 2 – New P.S. to Divert Most Flows to Metro	Alternative 4 – New P.S. to Divert All Flows to Metro
Net Present Value of Capital Costs	$4,746,642	$4,449,795	$4,111,716	$9,342,306
Net Present Value of Operations and Maintenance Labor Costs	$0	$0	$883,564	$883,564
Net Present Value of Operations and Maintenance Energy Costs	$0	$0	$191,067	$309,414
TOTAL	$4,746,642	$4,449,795	$5,186,347	$10,535,284

Life Cycle Cost Analysis Example

XYZ Project						
Alternative 1 - Partial Demolition with Gravel Fill						
Date						
NET PRESENT VALUE (Net Cost)	$451,449					
INITIAL NET COST	$345,677					
Discount Rate =	2.70%					
Discount Rate Basis:	Real Interest Rate on 30-year Treasury Bill as of December 2009 (recommended long-term discount					
Year Zero =	2010					

Asset Management Ten Core Processes



Service Levels

- Highest Level Performance Measure
- Stakeholder Expectations
  - Residential customers
  - Business/Industry
  - Critical needs (e.g., hospitals and fire)
  - Political Leadership
  - REGULATORY REQUIREMENTS
- Willingness to Pay

Revised March 26, 2015

Seattle Public Utilities Service Levels

Below are SPU's services and service levels that we will report on in 2015 to SPU employees to City Council:

Focus Area: Making it Easier to Get Help and Find Answers

SPU Services	Service Levels
Effective customer service	Customers rank their satisfaction with SPU services at least 5 on a scale of 1-7
	% of customer issues resolved in first phone call (target TBD)
	% of customer bills that do not require adjustment (target TBD)
	Respond to 90% of priority drinking water, drainage, and wastewater problems within one hour
	Increase households enrolled in the Utility Discount Program from 17,079 in January 2015 to 19,600 by year-end

Focus Area: Better Protecting Your Health and Our Environment

SPU Services	Service Levels
Mountain fresh drinking water	Maintain 100% compliance with Department of Health regulations
	Provide instream water for fish and meet other tribal, regional, state, and federal commitments
Safe sewage transport to King County treatment plants; drainage that reduces flooding & pollution	Limit sanitary sewer overflows to no more than 4 per 100 miles of pipe per year
	Limit combined sewer overflows to waterbodies to 1 per outfall per year
	Remove 100 tons of pollutants from roads during 2015
Planning for the future	To support the Citywide goal of 700 million gallons of runoff managed using Green Stormwater Infrastructure by 2025, SPU has a 2015 target of managing 8 million gallons of stormwater via RainWise rain gardens and cisterns
	Achieve goals for water conservation
Effective recycling and composting	Increase solid waste recycling to 60% by December 2015 and 70% by 2022
Efficient graffiti removal	Clean up graffiti on SPU property and SDOT structures within targeted times (10 business days for SDOT structures; 6 business days for SPU property)

SPU Service Level Goals (continued)

Focus Area: Improving How We Work to Deliver Consistent, High Quality Services

SPU Services	Service Levels
Mountain fresh drinking water	Limit yearly drinking water outages of more than 4 hours to less than 4% of retail customers
	Meet obligations in wholesale customer contracts for pressure, flow, and unplanned transmission system outages
Drainage that reduces flooding & pollution	No critical services (e.g., hospitals) are inaccessible due to flooding, except during extreme storm events (events exceeding a 100-year, 24-hour design storm event)
Dependable solid waste pickup	Provide reliable solid waste pickup with only one missed pickup for each 1,000 stops
	Limit late container deliveries to a maximum of two per 100 deliveries
	Collect at least 95% of missed solid waste pickups within one business day following notification by customers
All services	Stay within the overall 4.6% rate path through 2020
	Meet the aspirational goals for WMBE usage in purchasing and consulting contracts

NOTE: The Workforce Focus Area is not specifically represented here, but it indirectly affects all services levels.

Service Levels – Customer Reporting

Water and Waste

Customer Service Standards

contact details

Customer Service Centre's:

Council Chambers,
119-145 Spence Str., Cairns

Stockland Shopping Centre,
Mulgrave Rd, Earlville

Gordonvale Library,
88 Norman St, Gordonvale

Smithfield Library
Cheviot St, Smithfield

Mossman Offices
64-66 Front St., Mossman

Postal Address:

General Manager
Cairns Regional Council
Water & Waste
PO Box 359
Cairns Qld 4870

Business Address:

119-145 Spence St.
Cairns Qld 4870

Phone:

Cairns: 07 4044 3044
Mossman: 07 4099 9444
Toll-free: 1800 070 444

Website:

www.cairns.qld.gov.au

Email:

council@cairns.qld.gov.au

Cairns Regional COUNCIL
Water and Waste

mission statement

To deliver quality and reliable water, wastewater and solid waste services that meet the needs of the community.

customer service standards

Cairns Regional Water & Waste is a commercialised business unit of Cairns Regional Council charged with the responsibility of providing water, wastewater and solid waste services, including recycling to the Cairns community. These services are provided to over 150,000 residential customers and tourists, in addition to over 4,000 commercial and industrial customers.

Water Services Performance Indicators

	Performance Indicator	Performance measure	Target
Day to Day Continuity	Number of connections experiencing unplanned interruptions	Per 1000 connections / year	150
	Number of connections experiencing planned interruptions	Per 1000 connections / year	15
	Time for restoration of service	% of services restored < 5 hrs	98%
	Response/reaction time to incidents (emergency)	% of response to emergency < 30 min	98%
	Response/reaction time to incidents (all events)	% of response to incident <24 hours	95%
	Connections receiving 1 interruption per year	% of connections	12%
	Average interruption duration – planned	Hours	1.5
	Average interruption duration - unplanned	Hours	1.5
	Relative incidence of planned and unplanned interruption water incidents (events)	Ratio	1:11
Adequacy and quality of normal supply	Minimum pressure at property boundary	kpa	220
	Maximum pressure at property boundary	kpa	500
	Drinking water quality complaints	Per 1000 connections / year	<5
	E. Coli result for class C recycled water	Less than 1000 cfu/100mL (of samples taken for a twelve month period)	95%
	Drinking water quality incidents	Number of incidents	15
	Urban / rural supplies – E. Coli	Nil per 100mL	98%
	Urban / rural supplies - turbidity	< 5NTU	95%
	Urban / rural supplies – pH	6.5 to 8.5	98%
	Urban / rural supplies - colour	Up to 15.0	98%
Continuity in the long term	Water main breaks and leaks	Per 100km / year	17

1

This document provides details on the following:

- Obligations of Cairns Regional Council Water & Waste in delivering the water , wastewater and solid waste services;
- Levels of service to be provided to our customers based on performance indicators and goals;
- Expectations we have for our customers.

This is a condensed version of the complete Cairns Regional Water & Waste Customer Service Standards, available on our website. Including information on billing, new services, metering, complaints and resolution.

www.cairns.qld.gov.au

Sewage Wastewater Services Performance Indicators

	Performance Indicator	Performance measure	Target
Effective transport of sewage	Sewage overflows	Per 100km / year (gravity and rising main)	<15
	Sewage overflows to customer properties	Per 1000 connections / year	<2
	Odour complaints	Per 1000 connections / year	<2
	Response/reaction time to incidents (all events)*	% of response to all events < 24 hrs	98%
	Response/reaction time to incidents (emergency)	% of response to emergency < 1 hour	98%
	Priority one events when service restored within 5 hours	% restored within 5 hours	95%
Continuity in the long run	Sewer main breaks and chokes	Per 100km / year	<10

Waste & Recycling Services Performance Indicators

	Performance Indicator	Performance measure	Target
Effective Collection of Residential Waste	New bin delivery	Response time for new bin delivery	100% within 48 hours
	Missed services - kerbside waste	Number of missed services per month	Less than or equal to 1 per 1000 services
	Response time to missed services - kerbside waste	Response time for collection of missed kerbside waste services	100% within 24 hours
	Missed services - kerbside recycling	Number of missed services per month	Less than or equal to 1 per 1000 services
	Response time to missed services - kerbside recycling	Response time for collection of missed kerbside waste services	100% within 24 hours
	Response time to repair/replacement requests - kerbside waste and recycling	Response time to repair/replace requests for kerbside waste and recycling	100% within 48 hours

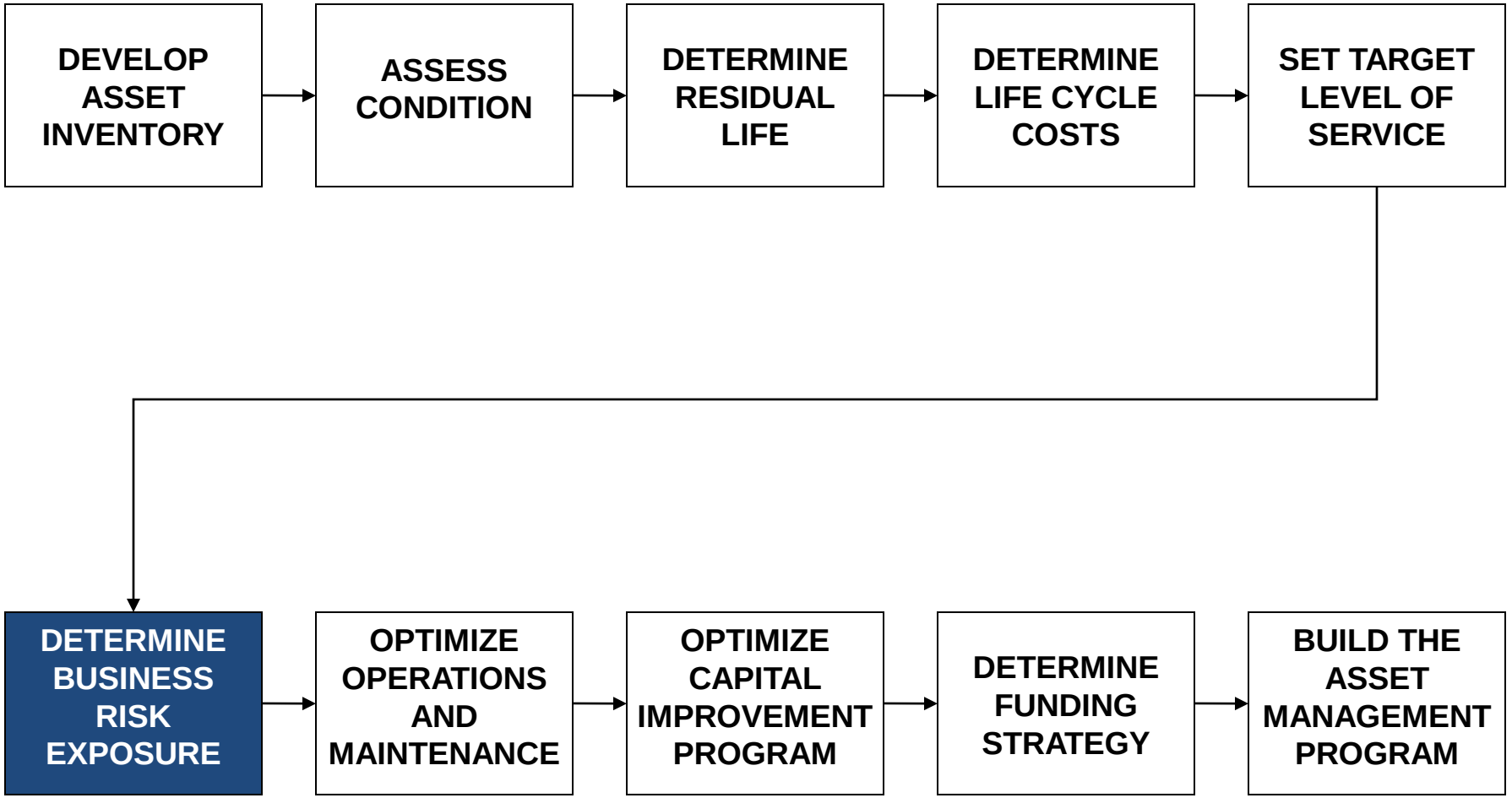
Customer Assistance Performance Indicators

	Performance Indicator	Performance measure	Goal
Customer Assistance Performance Goals	Install new residential water connection	Working days	15
	Number of properties that do not receive 48 hours advance notice for planned water and sewerage works	Number	0
	Average time taken by Water and Waste to respond to customer calls (rings)	Rings	4
	Customer Request Management (CRM) completed within prescribed timeframe	5 Working days	95%

Emergency Assistance: Cairns Regional Water & Waste maintains a 24-hour contact service for emergency events related to service systems, such as a burst water main or sewage overflow. **Please call during and after hours on 40443044**

2

Asset Management Ten Core Processes



Life Cycle Costs and Business Risk Exposure

- Economic
  - Capital
  - Operations and Maintenance
  - Repair
  - Loss of Business Opportunity
- Environmental
- Social

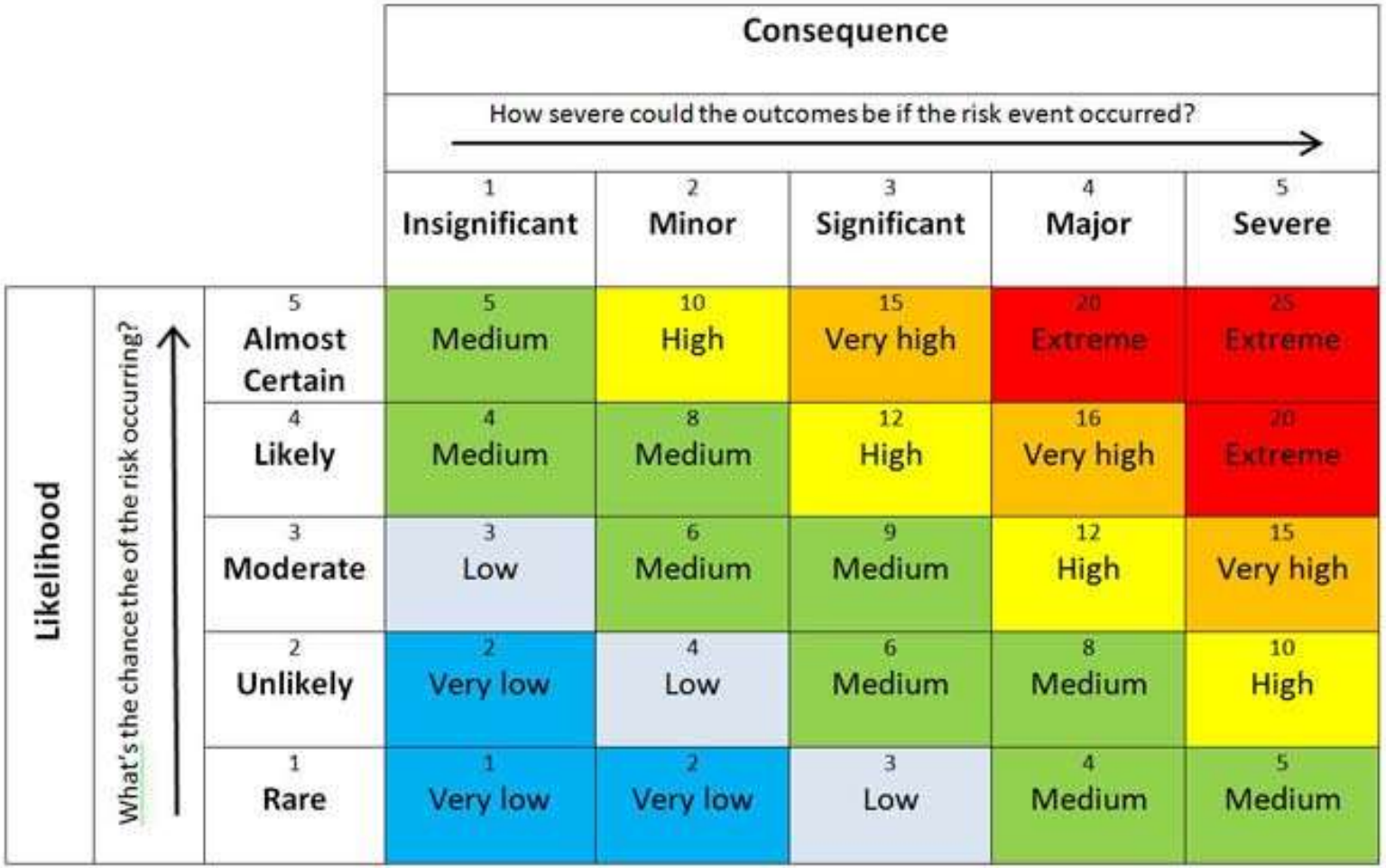
Failure Consequence (Pipeline Example)

- Pipeline Size and System Importance
- Alignment
  - Easement
  - Residential Street
  - Minor Arterial
  - Major Arterial
- Critical Facilities
  - -Police
  - -Fire
  - -Hospital
  - -Freeways, petroleum product transmission lines, etc.

Failure Consequence (Pipeline Example Cont.)

- Neighborhood
  - Third Party Damage
  - Business and social interruption
- Pipeline Depth
- Parks and environmentally sensitive areas
- Coordination with other CIP projects

Risk:
Probability of Failure X Consequence of Failure



Probability of Failure

Model with Weibull cumulative distribution function

$$F_T(t) = 1 - \exp[-(\frac{t}{\eta})^{\beta}]$$

Where

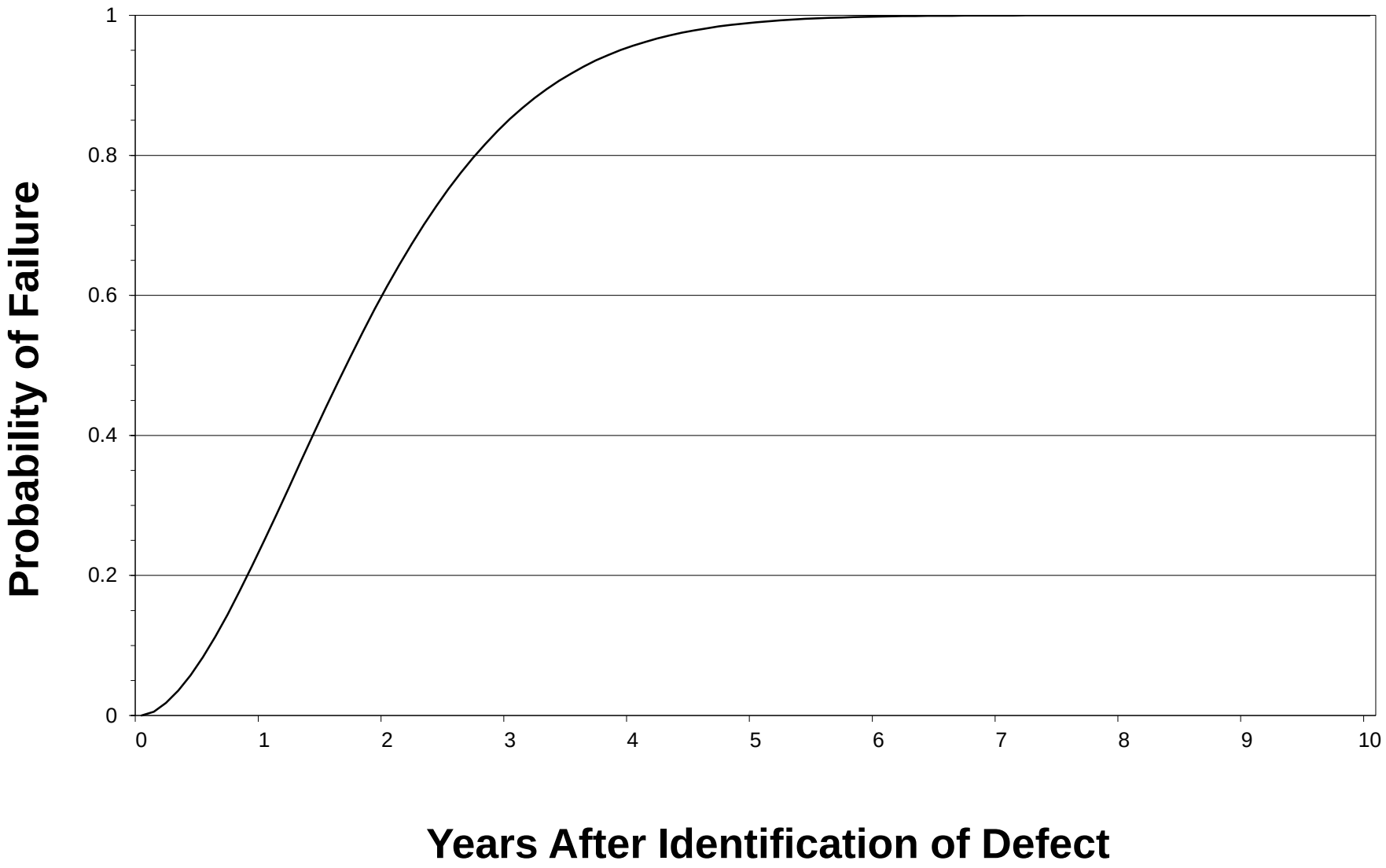
$F_T(t) =$ the probability that the defect results in failure by time t

β, η = Weibull distribution parameters

Assumed Probability of Failure

Defect Severity Level	End of Year	Probability of Failure	End of Year	Probability of Failure
High	1	0.25	5	0.99
Medium	5	0.25	10	0.99
Low	10	0.05	20	0.75

High Severity Defect Probability of Failure



Failure Probability for Unrepaired Defects

Given that a defect has not "failed" by the end of year t, the probability of failure in the next year, $f_T(t)$, is

$$f_T(t) = \frac{F_T(t+1) - F_T(t)}{1 - F_T(t)}$$

Where $F_T(t)$ and $F_T(t+1)$ are the Weibull cumulative probabilities of failure at time t and time t+1

Length of Time Since Defect Was Identified	Probability of Failure if Failure Has Not Yet Occurred		
	High	Medium	Low
Less Than 1 Year	0.25	~ 0	~ 0
From 1 to 2 Years	0.48	0.007	0.001
From 2 to 3 Years	0.62	0.03	0.002
From 3 to 4 Years	0.71	0.08	0.003
From 4 to 5 Years	0.77	0.16	0.005
From 5 to 6 Years	0.82	0.27	0.006
From 6 to 7 Years	0.85	0.40	0.009
From 7 to 8 Year	0.88	0.54	0.011
From 8 to 9 Years	0.90	0.68	0.014
From 9 to 10 Years	0.92	0.79	0.017

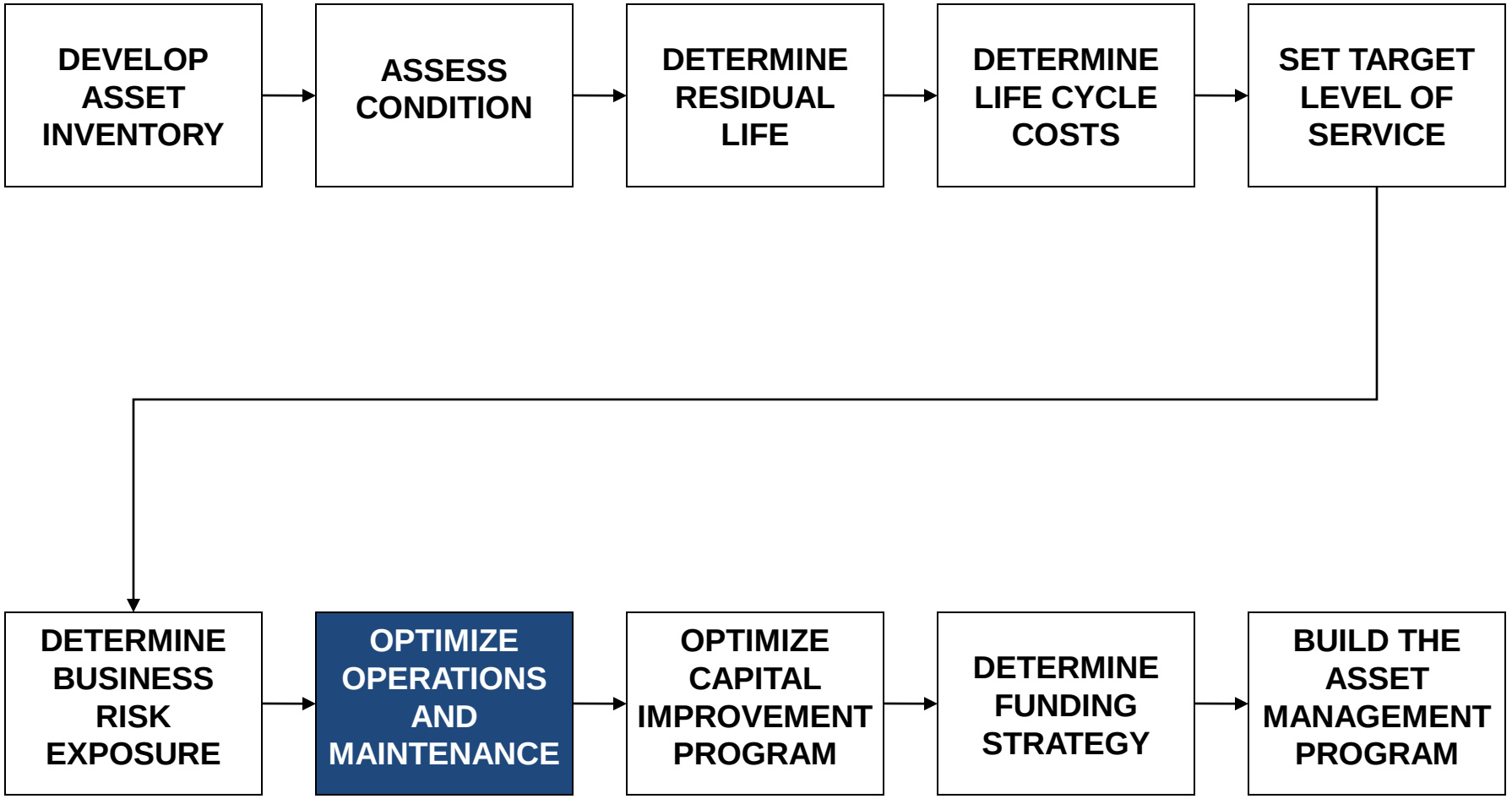
Sewer Repair List

WO-0073

Section: WASTEWATER

Workorder	Asset	LegacyID	Pri	Status	Address	Claims	Low Conn	Div	Failure Conseq	Failure Prob	Yr	Rank	Risk
UT-07-16855	197446	SL04-0139	H	APPR	2709 86TH AVE NE		Y	OM	$80,060	0.706354	4	31	56,551
	Desc: Repair broken mainline pipe.												
UT-10-02075	196947	SL04-0242	H	APPR	9038 NE 20TH ST		Y	OM	$64,560	0.484195	2	60	31,260
	Desc: Remove unused defective service connection.												
UT-10-02079	196947	SL04-0242	H	APPR	2023 92ND AVE NE		Y	OM	$64,560	0.484195	2	60	31,260
	Desc: Replace defective service connection and stub.												
UT-06-04542	197116	SL05-0112	M	APPR	8429 NE 7TH ST		Y	OM	$100,340	0.265770	6	91	26,667
	Desc: REPLACE FAILED MAIN LINE WYE & LATERAL TO ROW.												
UT-10-02092	201113	SL08-0229	H	APPR	110 NORTHSIDE RD		Y	OM	$35,820	0.484195	2	136	17,344
	Desc: Replace defective service connection and stub.												
UT-07-09344	197115	SL05-0113	M	APPR	8436 NE 7TH ST		Y	OM	$100,340	0.156222	5	165	15,675
	Desc: REPLACE DEFECTIVE SERVICE CONNECTION.												
UT-05-16954	206847	SL39-0521	M	WINVOICE	4429 148TH PL SE		Y	OM	$57,868	0.265770	6	169	15,380
	Desc: REPLACE DAMAGED MAINLINE TEE.												
15458	197693	SL08-0109	H	APPR	9217 SE SHORELAND DR			OM	$28,000	0.484195	2	178	13,557
	Desc: Replace broken root infested service stub												
UT-10-02015	206520	SL23-0425	H	APPR	15421 SE 20TH PL		Y	OM	$28,000	0.484195	2	178	13,557
	Desc: Replace defective service connection and stub.												
UT-10-02023	208511	SL26-0114	H	APPR	14823 NE 14TH ST			OM	$28,000	0.484195	2	178	13,557
	Desc: Replace defective service connection and stub.												
UT-10-02027	215206	SL28-0149	H	APPR	2917 165TH PL NE		Y	OM	$27,360	0.484195	2	194	13,248
	Desc: Replace defective service connection and 8 feet of mainline pipe.												
UT-10-02040	215506	SL30-0256	H	APPR	16015 NE 2ND ST		Y	OM	$26,560	0.484195	2	201	12,860
	Desc: Replace defective service connection and stub.												
UT-06-12214	198908	SL01-0259	M	APPR	2001 77TH AVE NE			OM	$43,500	0.265770	6	212	11,561
	Desc: REPLACE BROKEN MAINLINE PIPE.												
UT-05-17379	210400	SL16-0168	M	APPR	2422 124TH PL NE		Y	OM	$42,020	0.265770	6	221	11,168
	Desc: REPLACE DAMAGED MAINLINE PIPE & TEE.												
UT-10-02032	208287	SL28-0114	H	APPR	2918 165TH PL NE		Y	OM	$20,820	0.484195	2	233	10,081

Asset Management Ten Core Processes



Now that we are done pigging out!

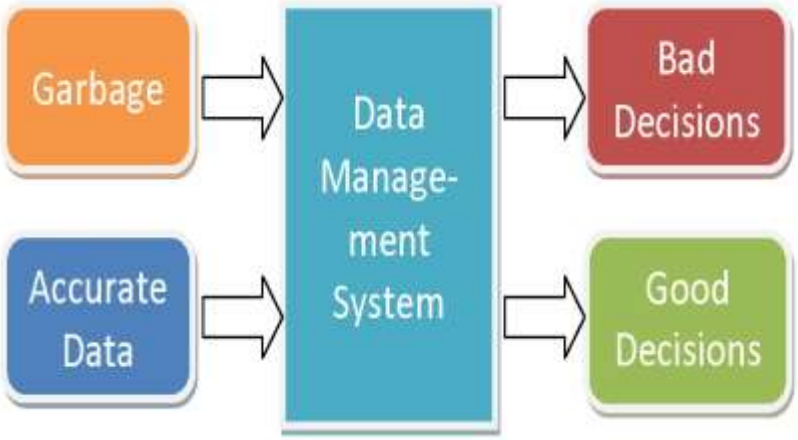
Asset Management

Replace it on time or fix it on their time!

Condition Assessment

Field Crew buy in is critical for success!

- Engage staff early and invite them to be a part of the process to develop the various templates you use to collect the data.
- Be proactive by engaging staff so they understand why they are collecting the data.
- Field crews are there for support and to get the data into the system.
- The Asset Manager should mine their own data and understand the systems in place to do so.
- Recommend holding staff meetings annually to show field crews how their efforts affect the big picture.



Optimize Operations and Maintenance

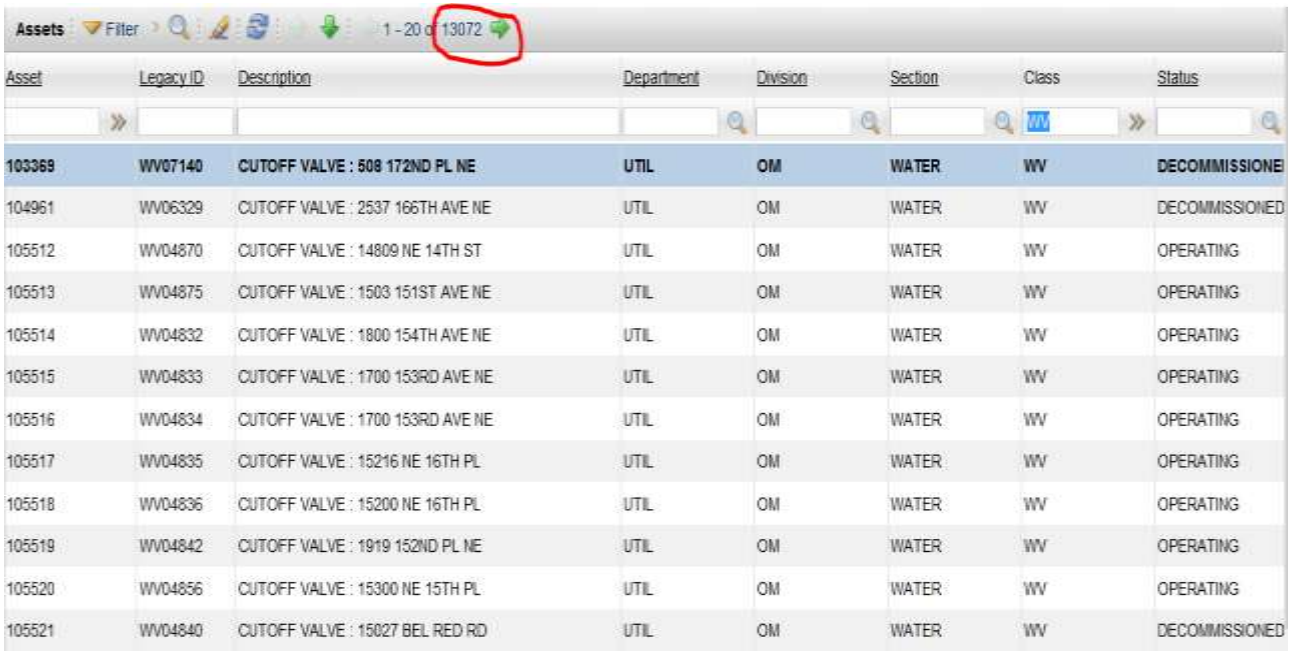
Asset inventory – what are your assets?

- Fire Hydrants
- Valves
- PRVs
- Pumps
- Motors
- Generators
- Water Meters
- Reservoirs
- Water Mains
- Service lines
- Air Vacs
- Blow Off assemblies
- Water Quality analyzers

Where do you store all of the information?

Important to understand the capabilities of the software you have available.

- Does the software work for you or do you work for it?
- Is it static or easily customizable?
- Does it interface with other software systems?
- Who supports it? IT Department, third party vendor, in-house.
- Who will be using it vs having access? What permissions will you establish to maintain “clean” data.
- User training, who enters changes, who mines the data?
- Accept that it will never be perfect and that it will evolve and change over time.



Assets Filter 1 - 20 of 13072

Asset	Legacy ID	Description	Department	Division	Section	Class	Status
103369	WV07140	CUTOFF VALVE : 508 172ND PL NE	UTIL	OM	WATER	WV	DECOMMISSIONE
104961	WV06329	CUTOFF VALVE : 2537 166TH AVE NE	UTIL	OM	WATER	WV	DECOMMISSIONED
105512	WV04870	CUTOFF VALVE : 14809 NE 14TH ST	UTIL	OM	WATER	WV	OPERATING
105513	WV04875	CUTOFF VALVE : 1503 151ST AVE NE	UTIL	OM	WATER	WV	OPERATING
105514	WV04832	CUTOFF VALVE : 1800 154TH AVE NE	UTIL	OM	WATER	WV	OPERATING
105515	WV04833	CUTOFF VALVE : 1700 153RD AVE NE	UTIL	OM	WATER	WV	OPERATING
105516	WV04834	CUTOFF VALVE : 1700 153RD AVE NE	UTIL	OM	WATER	WV	OPERATING
105517	WV04835	CUTOFF VALVE : 15216 NE 16TH PL	UTIL	OM	WATER	WV	OPERATING
105518	WV04836	CUTOFF VALVE : 15200 NE 16TH PL	UTIL	OM	WATER	WV	OPERATING
105519	WV04842	CUTOFF VALVE : 1919 152ND PL NE	UTIL	OM	WATER	WV	OPERATING
105520	WV04856	CUTOFF VALVE : 15300 NE 15TH PL	UTIL	OM	WATER	WV	OPERATING
105521	WV04840	CUTOFF VALVE : 15027 BEL RED RD	UTIL	OM	WATER	WV	DECOMMISSIONED

Asset inventory details.

What do you want to know about your inventory?

Specifications - Every asset has a few common characteristics that should be known.

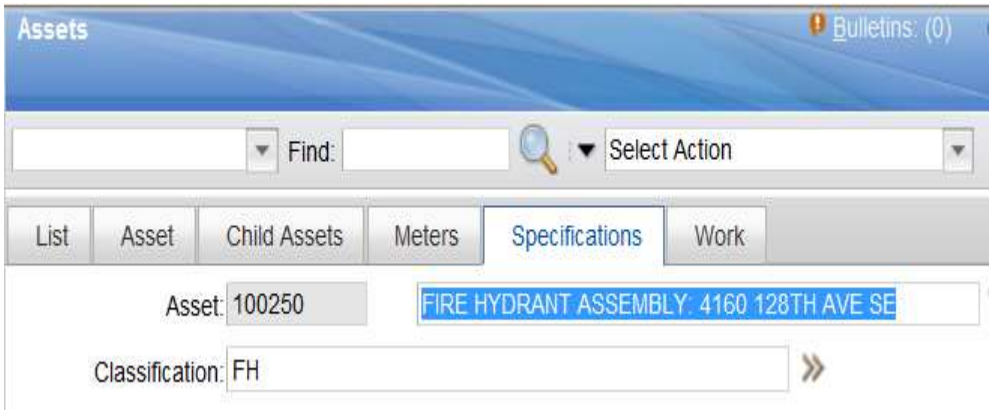
- Make - Who made it?
- Model – Which one do you have in your system.
- Manufacture year – Important over time as designs change.
- Install date (year) – This is when “service life” begins from an O&M perspective.
- Location – Physical address is important, Latitude/Longitude is good for mapping
- Asset ID # - Important to know for tracking, many methods for assigning a #.

Asset inventory details.

What do you want to know about your inventory?

Specifications – After the common traits there are details to track that are unique to certain assets.

- Fire Hydrants – aesthetics, length of run, foot valve location, port threads, etc…
- Valves – size, gate, butterfly, check, underground or in station, op nut vs wheel, etc…
- Water main – depth, material: DI, AC, CI – lined/unlined, HDPE, PVC, Size, wrapped, etc…
- Service line – saddle, direct tap, size, material, length, corp stop, curb stop, setter, resetter, etc…
- Pumps – gallons per minute, seal type, pump type, total dynamic head
- Motors - rotations per minute, horse power, amperage, VFD information if applicable, amperage
- PRV – valve sizes, pressure, supply zone, service zone, epoxy coated y/n, elevation
- Meters – serial #, size, commercial/domestic/irrigation, min/max flow rate detection, touch read, etc…

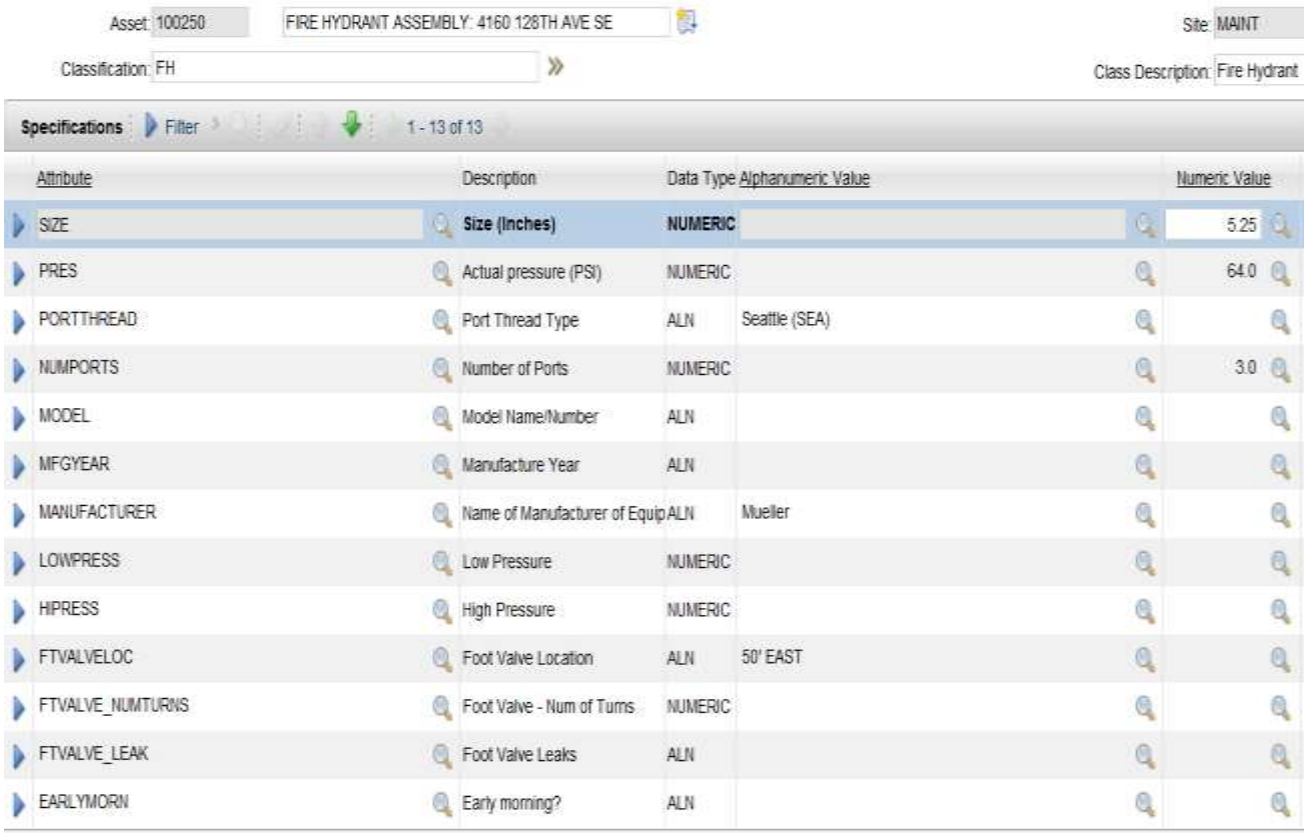


Asset inventory details.

What do you want to know about your inventory?

There's a lot you can track, balance what's important and think about what you will use the information for.

Patience is important if you have a lot of assets and many people that you rely on to document all of the details, it will not be perfect.



Asset: 100250 FIRE HYDRANT ASSEMBLY: 4160 128TH AVE SE Site: MAINT

Classification: FH Class Description: Fire Hydrant

Specifications | Filter | 1 - 13 of 13

Attribute	Description	Data Type	Alphanumeric Value	Numeric Value
SIZE	**Size (Inches)**	**NUMERIC**		5.25
PRES	Actual pressure (PSI)	NUMERIC		64.0
PORTTHREAD	Port Thread Type	ALN	Seattle (SEA)	
NUMPORTS	Number of Ports	NUMERIC		3.0
MODEL	Model Name/Number	ALN		
MFGYEAR	Manufacture Year	ALN		
MANUFACTURER	Name of Manufacturer of Equip	ALN	Mueller	
LOWPRESS	Low Pressure	NUMERIC		
HIPRESS	High Pressure	NUMERIC		
FTVALVELOC	Foot Valve Location	ALN	50' EAST	
FTVALVE_NUMTURNS	Foot Valve - Num of Turns	NUMERIC		
FTVALVE_LEAK	Foot Valve Leaks	ALN		
EARLYMORN	Early morning?	ALN		

Condition Assessment

How do you gather the information?

- **Above ground assets** – Fire Hydrants, pumps, motors, assets inside pump stations, reservoirs (internal & external). Easy to see and inspect on regular intervals.
- **Vaults** – PRVs, commercial meters, inlets.
- **Buried assets –** *these are unknown until they are known.* Buried assets are the most challenging. We rely on moments of opportunity to inspect and document their condition.

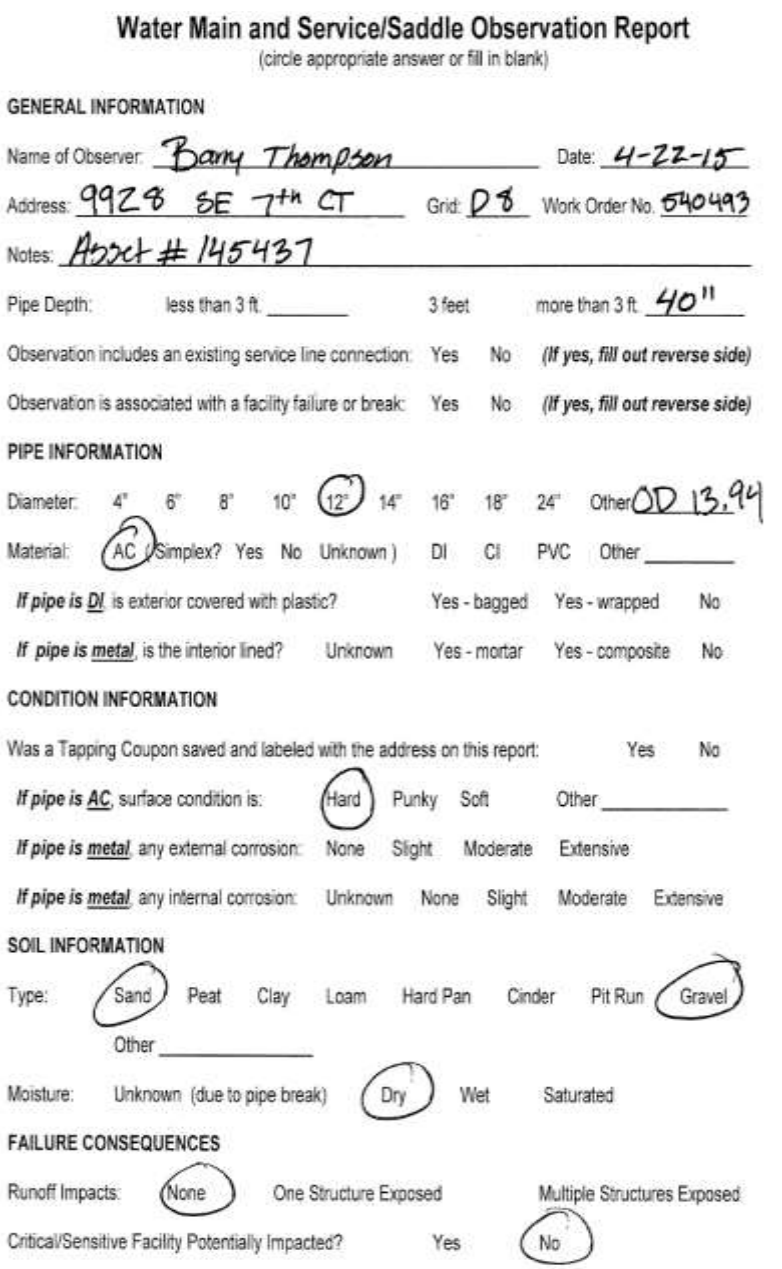
Condition Assessment

Main Observation Report (MOR)- A premade form to populate anytime field crews expose a water main.

Field crews should fill one of these out each time we get eyes on a watermain.

We often have to remind them to fill one out when the watermain is in GOOD condition as well as bad.

Opportunities: A lot of this information can be migrated into GIS and plotted onto map layers for better planning and long range forecasting.



Water Main and Service/Saddle Observation Report

(circle appropriate answer or fill in blank)

GENERAL INFORMATION

Name of Observer: Barry Thompson Date: 4-22-15

Address: 9928 SE 7th CT Grid: D8 Work Order No. 540493

Notes: Asset # 145437

Pipe Depth: less than 3 ft. _____ 3 feet more than 3 ft. 40"

Observation includes an existing service line connection: Yes No *(If yes, fill out reverse side)*

Observation is associated with a facility failure or break: Yes No *(If yes, fill out reverse side)*

PIPE INFORMATION

Diameter: 4" 6" 8" 10" (12") 14" 16" 18" 24" Other OD 13.94

Material: (AC) (Simplex? Yes No Unknown) DI CI PVC Other _____

If pipe is DI, is exterior covered with plastic? Yes - bagged Yes - wrapped No

If pipe is metal, is the interior lined? Unknown Yes - mortar Yes - composite No

CONDITION INFORMATION

Was a Tapping Coupon saved and labeled with the address on this report: Yes No

If pipe is AC, surface condition is: (Hard) Punky Soft Other _____

If pipe is metal, any external corrosion: None Slight Moderate Extensive

If pipe is metal, any internal corrosion: Unknown None Slight Moderate Extensive

SOIL INFORMATION

Type: (Sand) Peat Clay Loam Hard Pan Cinder Pit Run (Gravel)

Other _____

Moisture: Unknown (due to pipe break) (Dry) Wet Saturated

FAILURE CONSEQUENCES

Runoff Impacts: (None) One Structure Exposed Multiple Structures Exposed

Critical/Sensitive Facility Potentially Impacted? Yes (No)

If this main observation included a service line connection and/or is associated with a facility failure, Please fill out the appropriate information on the reverse side of this report.

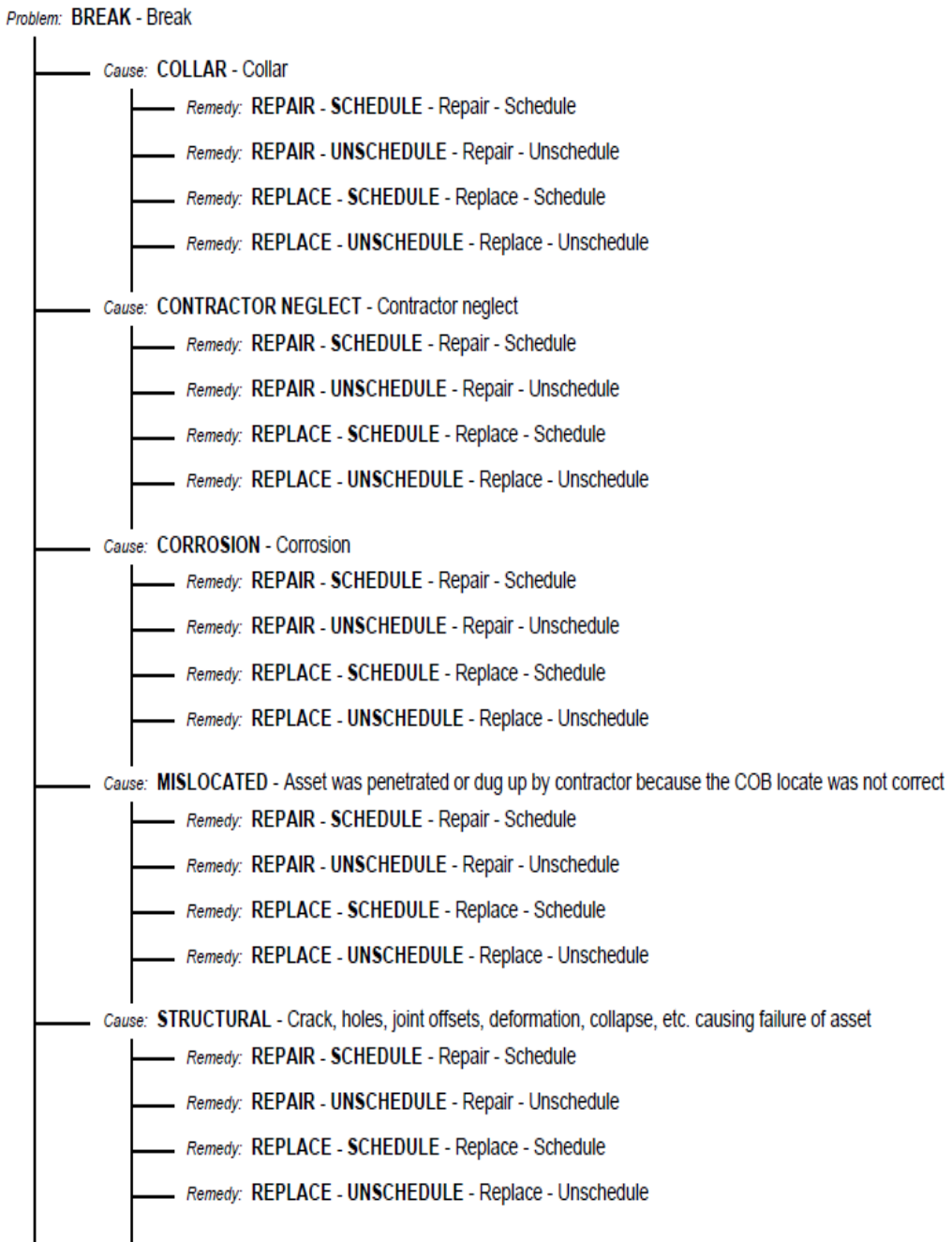
PCR

Problem- What is the observable problem that we are responding to?

Cause – What caused the problem we are responding to?

Remedy – What are we doing to fix the problem?

Each asset will have it's own unique set of PCRs. Be mindful of the strategies. If you try to be too granular you risk GiGo. (Garbage In Garbage Out)

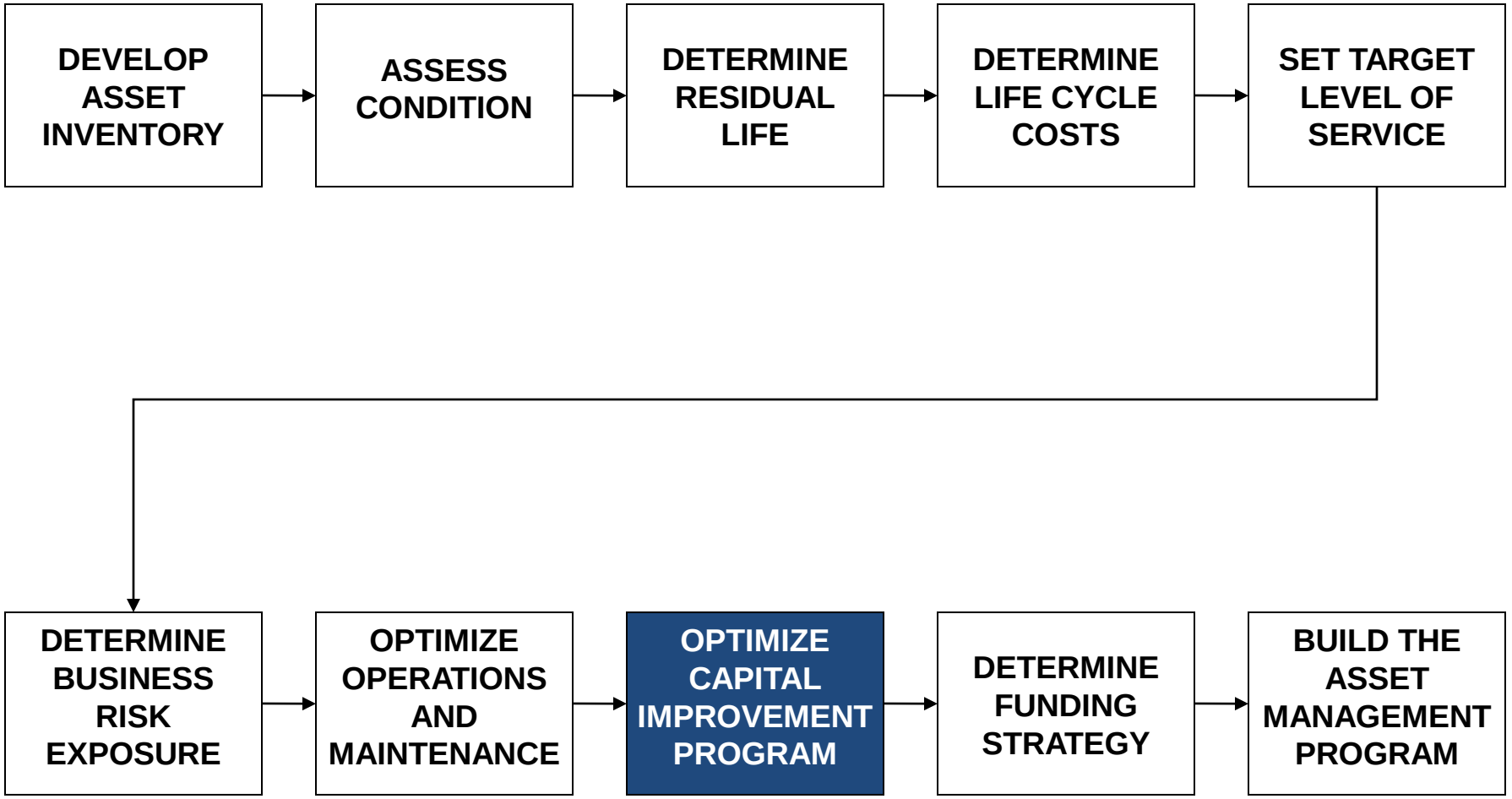


Asset Inventory

What do you do with all of tha

- **Document history** – when was it repaired/maintained, who worked on it, why was it worked on.
- **Track cost of ownership** – using a unique asset # allows us to view costs for each individual asset or we can easily expand to track costs for an asset class, we can be very granular; is there a particular make and model that requires more attention than others?
- **Identify trends for future planning** – water mains are a good example, an asset assumed to be young and have a long service life might develop a trend based on the type of backfill material that is causing corrosion and accelerated degradation. Good asset management gives us the opportunity to be proactive and do something before failure occurs.
- **Preventive Maintenance scheduling** – Established industry standards allows us to use the software to predict and produce automatic scheduling for assets. Examples: Fire Hydrants every two years, water valves every three years, reservoir cleaning every five years, commercial meter calibration/maintenance, fluid changes and other routine maintenance on pump motors and pumps.
- **Asset/ component replacement** – Example: bearing/packing replacement on pumps, PRV components; is it really necessary to replace the diaphragm rubber on a PRV every 5 years or does it vary based on other external factors like water quality or use? Asset management allows us to manage things better so we are getting the longest use out of expensive components as opposed to just replacing them because we happen to be there.

Asset Management Ten Core Processes



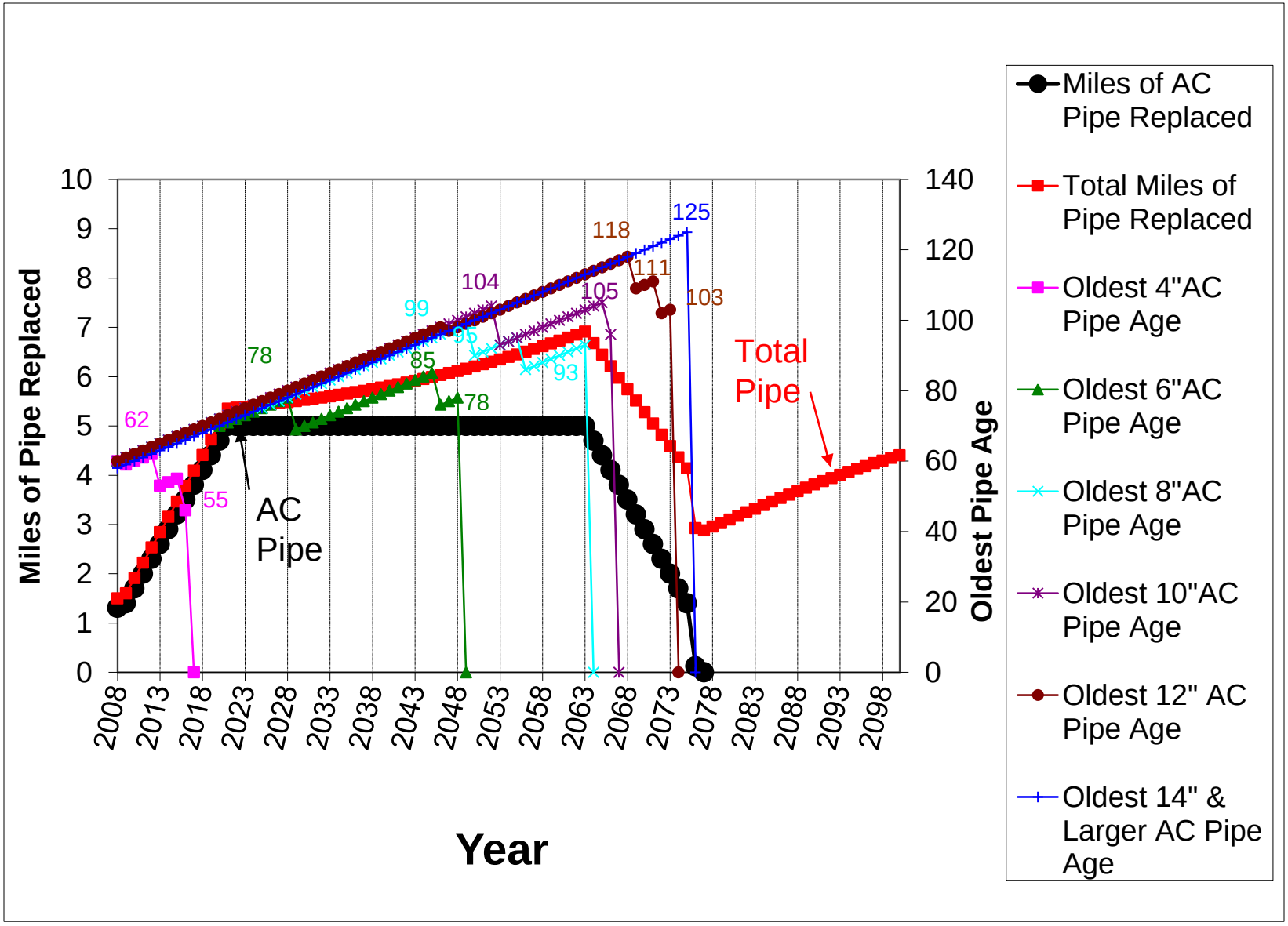
CIP Optimization - Example

Identify, Analyze and Selection Options (example)

Assumption: Pump station with a collapsing floor

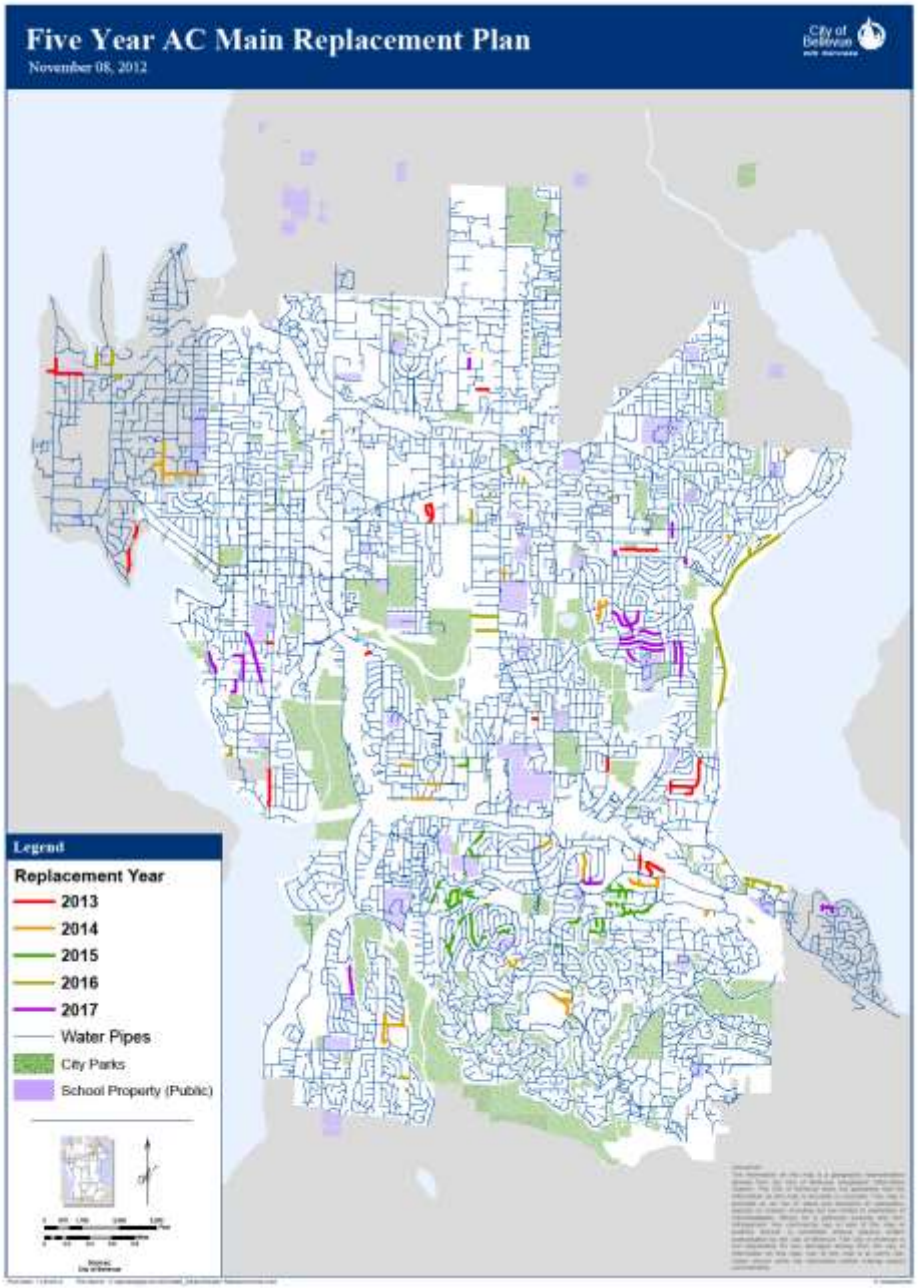
- Option 1 – Do Nothing
- Option 2 – Rebuild existing floor
- Option 3 – Upgrade entire structure to current standards
- Option 4 – Replace entire pump station with new above ground pump station
- Option 5 – Replace entire pump station with prefabricated below ground pump station

AC Main Replacement Schedule

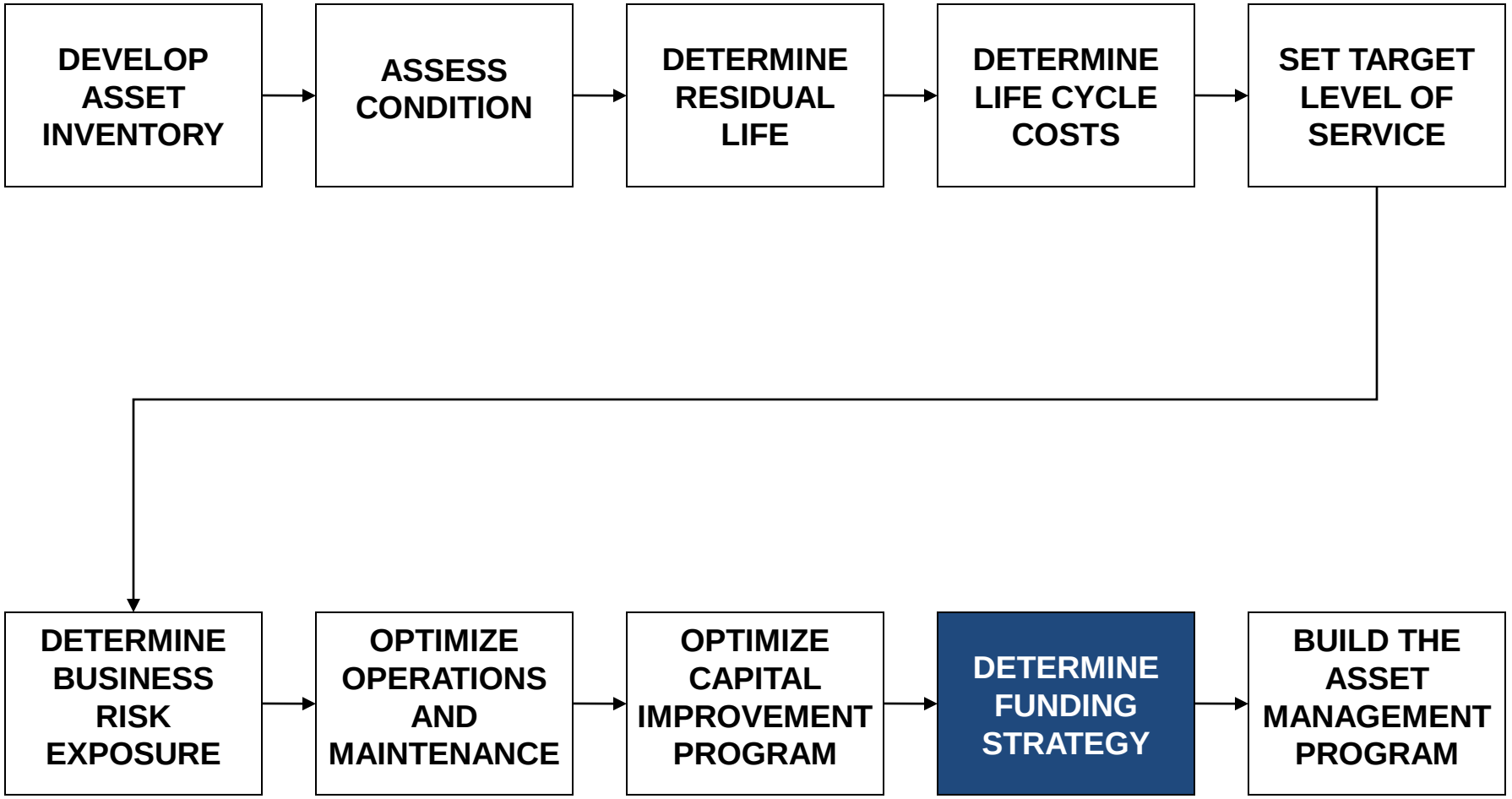


Asbestos Cement Watermain Five Year Replacement Plan

- Replacement based on risk
  - Probability of failure
  - Consequences of failure
- Focus is primarily on 4-inch and 6-inch mains



Asset Management Ten Core Processes



AM Long-Term Financial Planning: Context

- Substantial portions of the utility systems were constructed in 1950's and 1960's
- Current estimated replacement value of $3.5 Billion
- Recognize that utility systems are exceptionally long-lived
- Long term financial planning and a viable funding strategy is needed to properly position the City to protect its investments

Guiding Principles

- A comprehensive long-term financial management strategy is needed to assure that future financial needs are met
- Recognize that utility assets will benefit more than one generation, therefore need for intergenerational equity and fairness
- Assets should be replaced when needed but before it fails
- Achieve acceptable service levels at lowest life-cycle costs

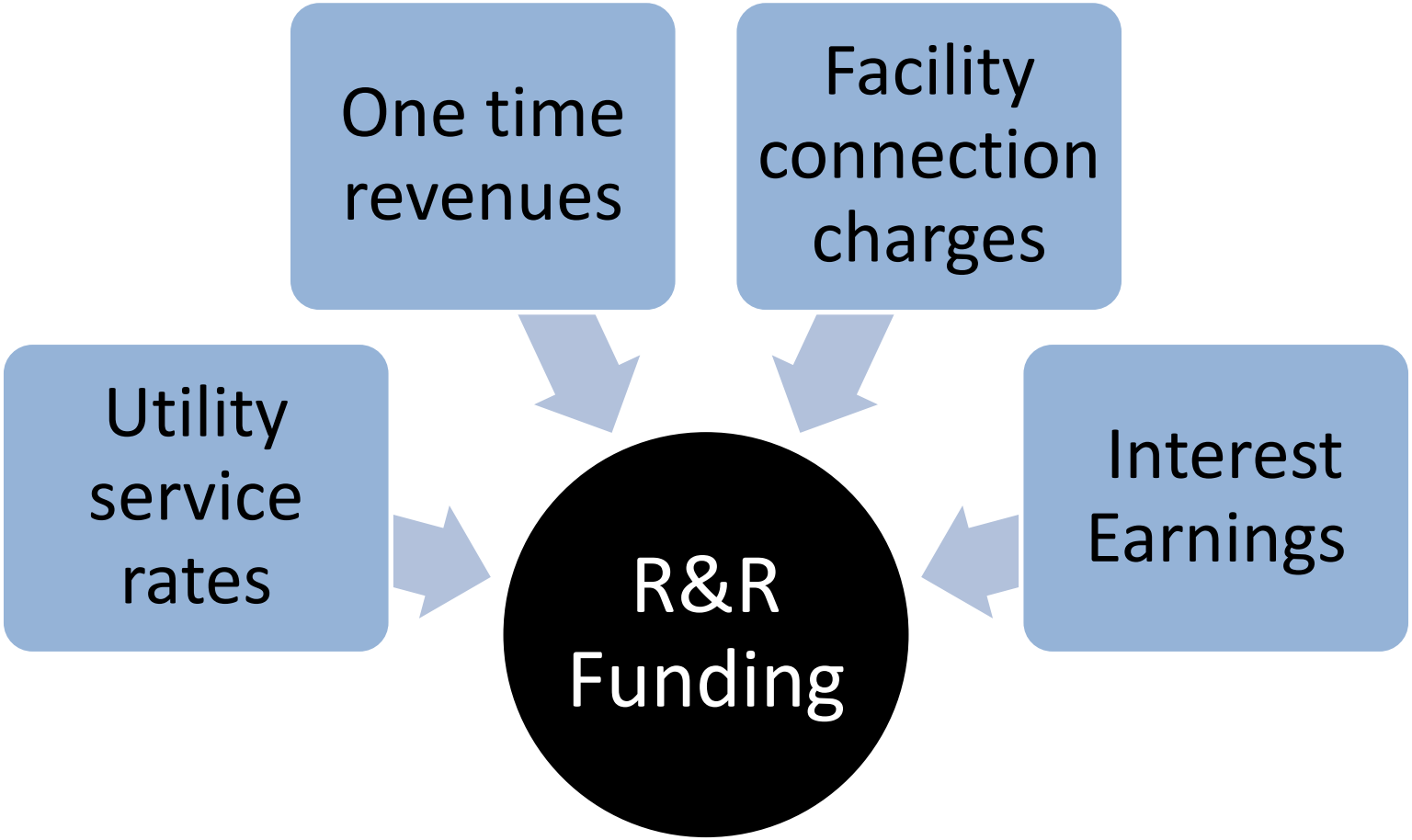
Renewal and Replacement Funding program

- Established in 1995
- Accumulate funds for future replacement of utility facilities
  - Policy guidance from Utility comprehensive plans and CIP
- Each utility has its own R&R account
- City Council determines how much will be designated for the R&R account

R&R Program Funding Policies

- Sufficient to meet projected costs over 75 year horizon
- Intergenerational equity will be achieved by making contributions to R&R which produces smooth rate transitions over planning period
- Funding should not fall below the current depreciation, less any debt principal payments
- Use of debt to provide financial flexibility

Sources of R&R Funding



Rates

- Primarily used to fund operations

- Generate resources to contribute to R&R
  - Gradual and uniform to avoid rate spikes
  - Contributions determined in conjunction with long-term 75-year planning horizon
  - Contributions levelized to assure intergenerational equity and consistency with long-term financial planning

One Time Revenues

- Unplanned transfers from operations or other sources

- CIP funds above current capital needs

Capital Facility Charges

- Facility connection charges
  - Charges to pay for equitable share of system costs at time of connection
    - Capital recovery charges
    - Direct facility connection charges

Interest Earnings

- R&R funds expected to accumulate tens of millions of dollars over time

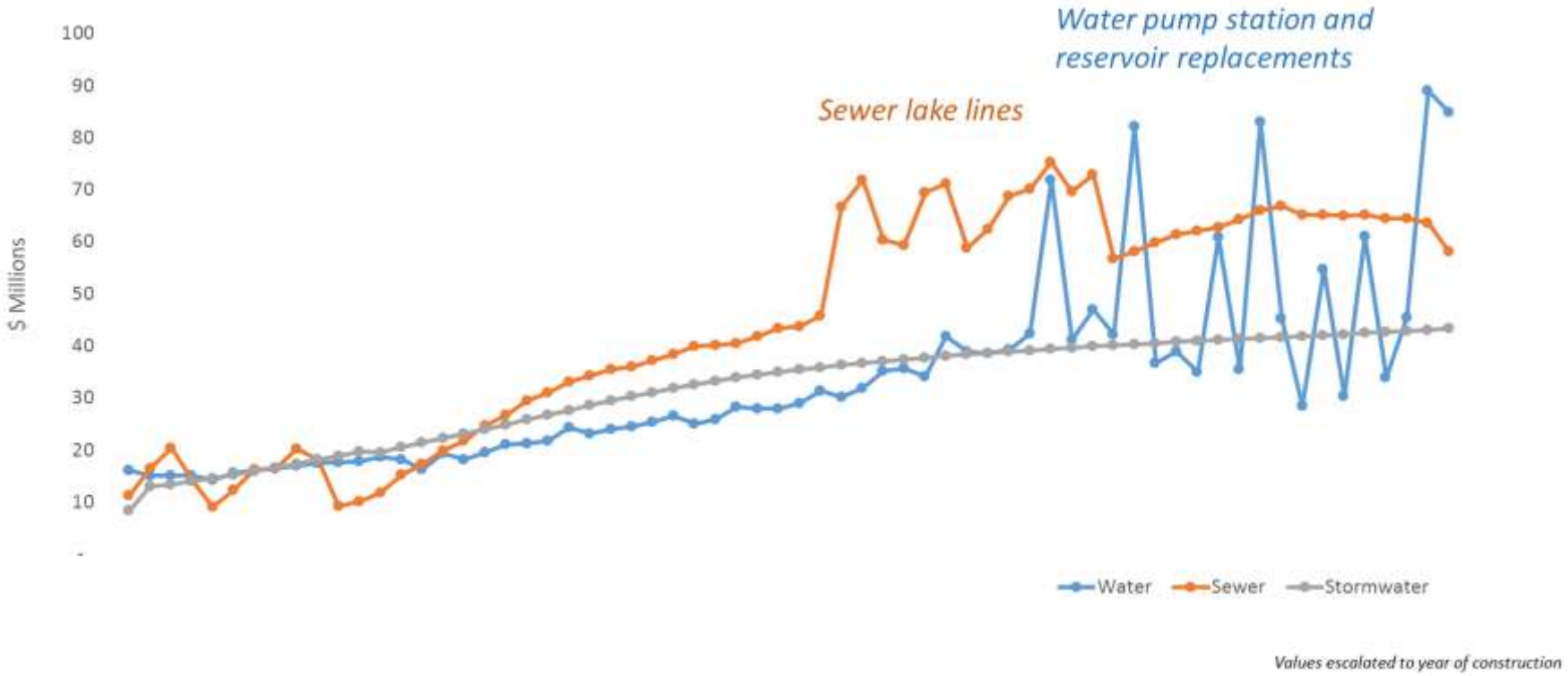
- Interest earnings will become a significant source of income

Restrictions on the use of R&R funds

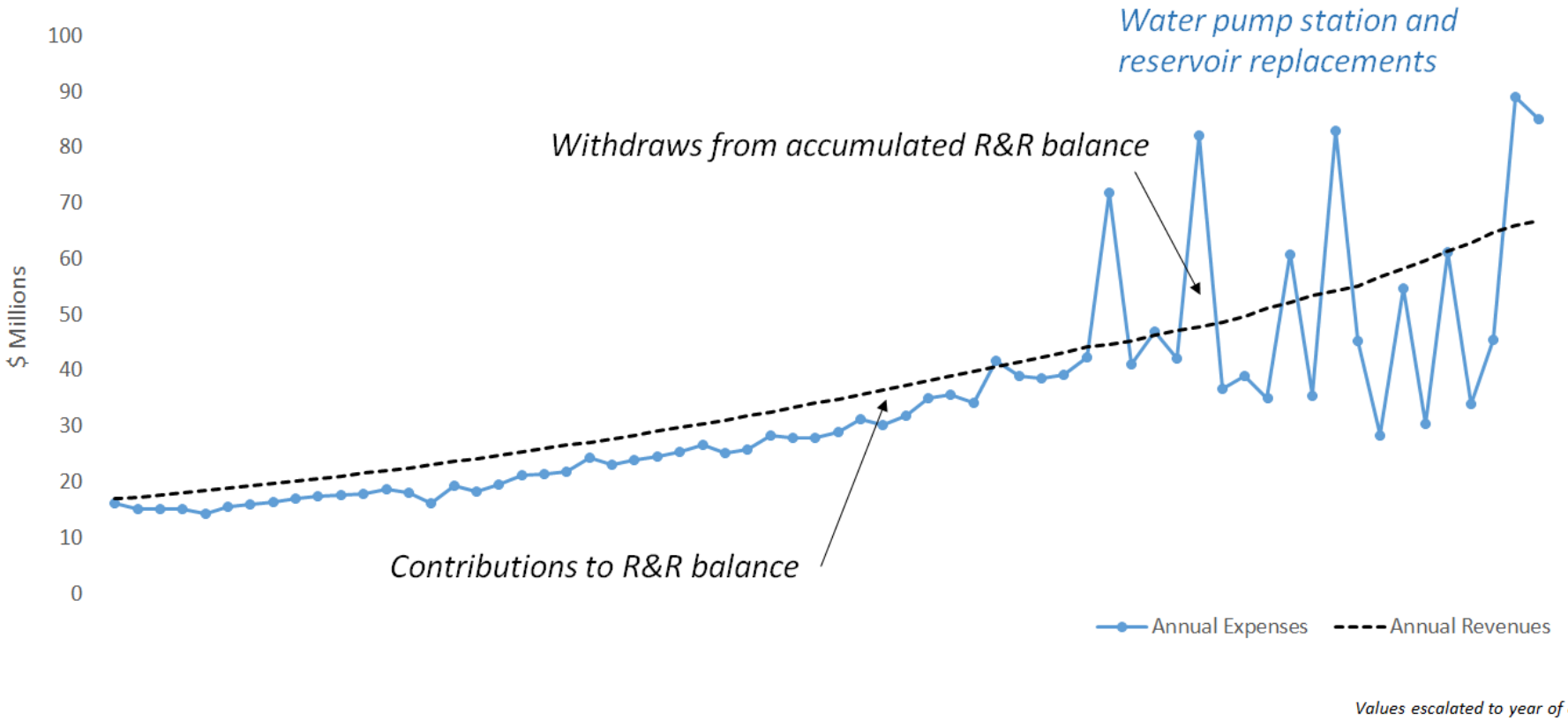
- Used for system renewal and replacement only

- May be loaned for other purposes, but must be repaid consistent with City financial policies and with interest

City of Bellevue – 75 Year Annual Asset Replacement Needs

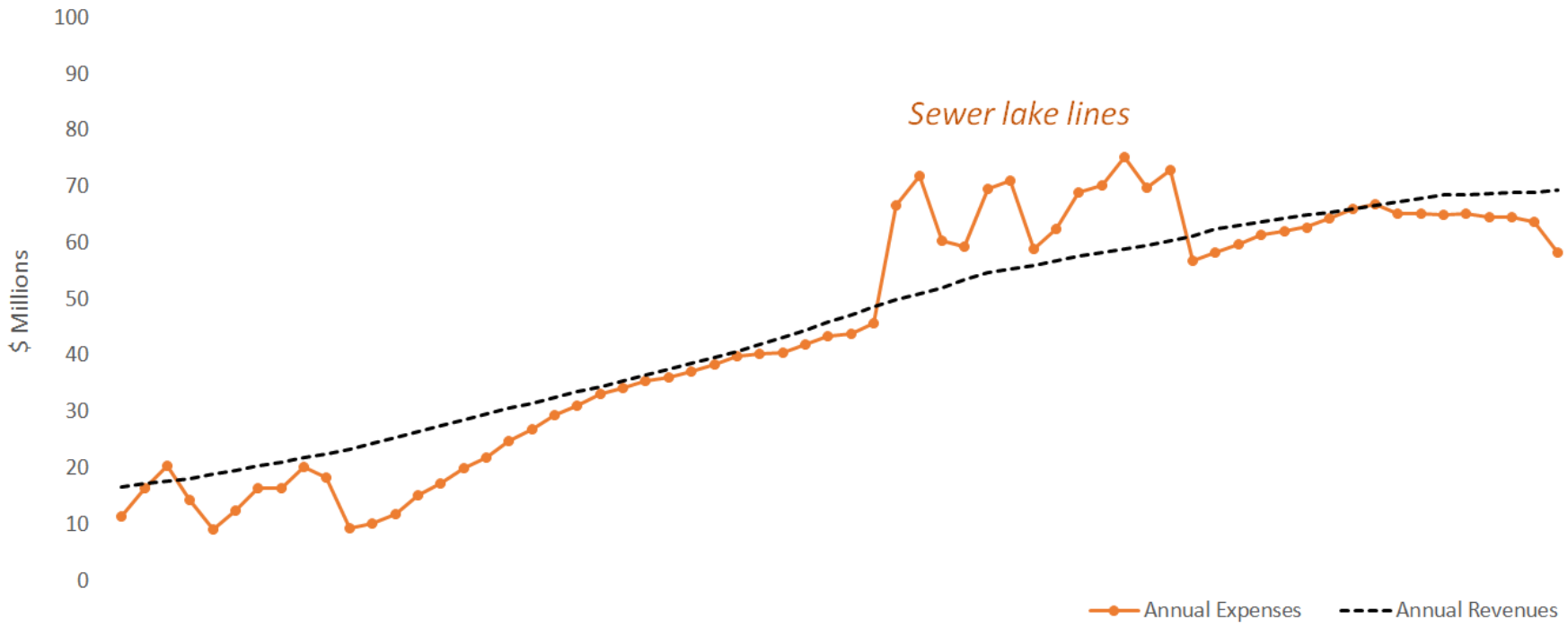


Water Utility – Funding vs Need



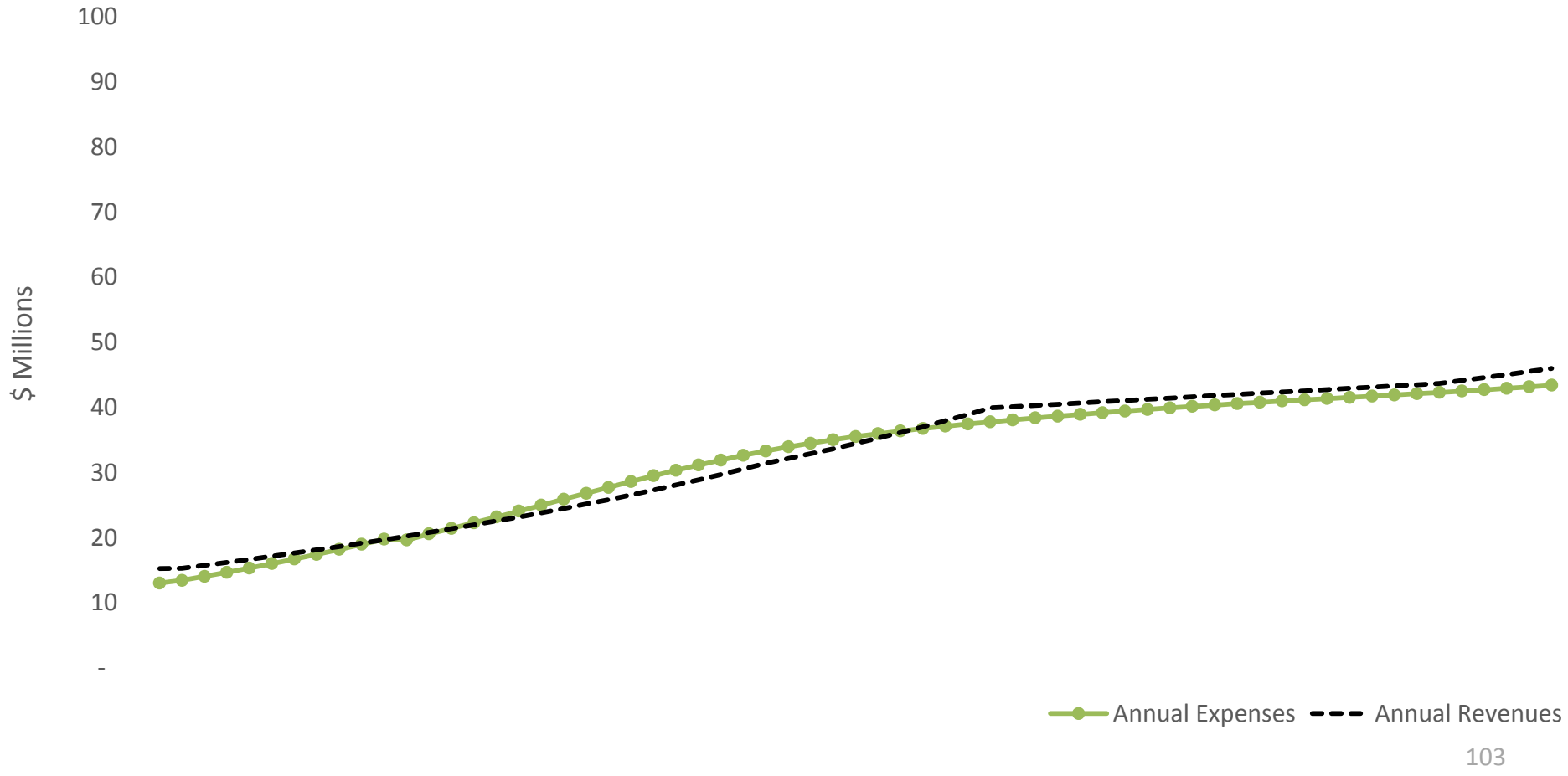
Values escalated to year of construction

Sewer Utility – Funding vs Need



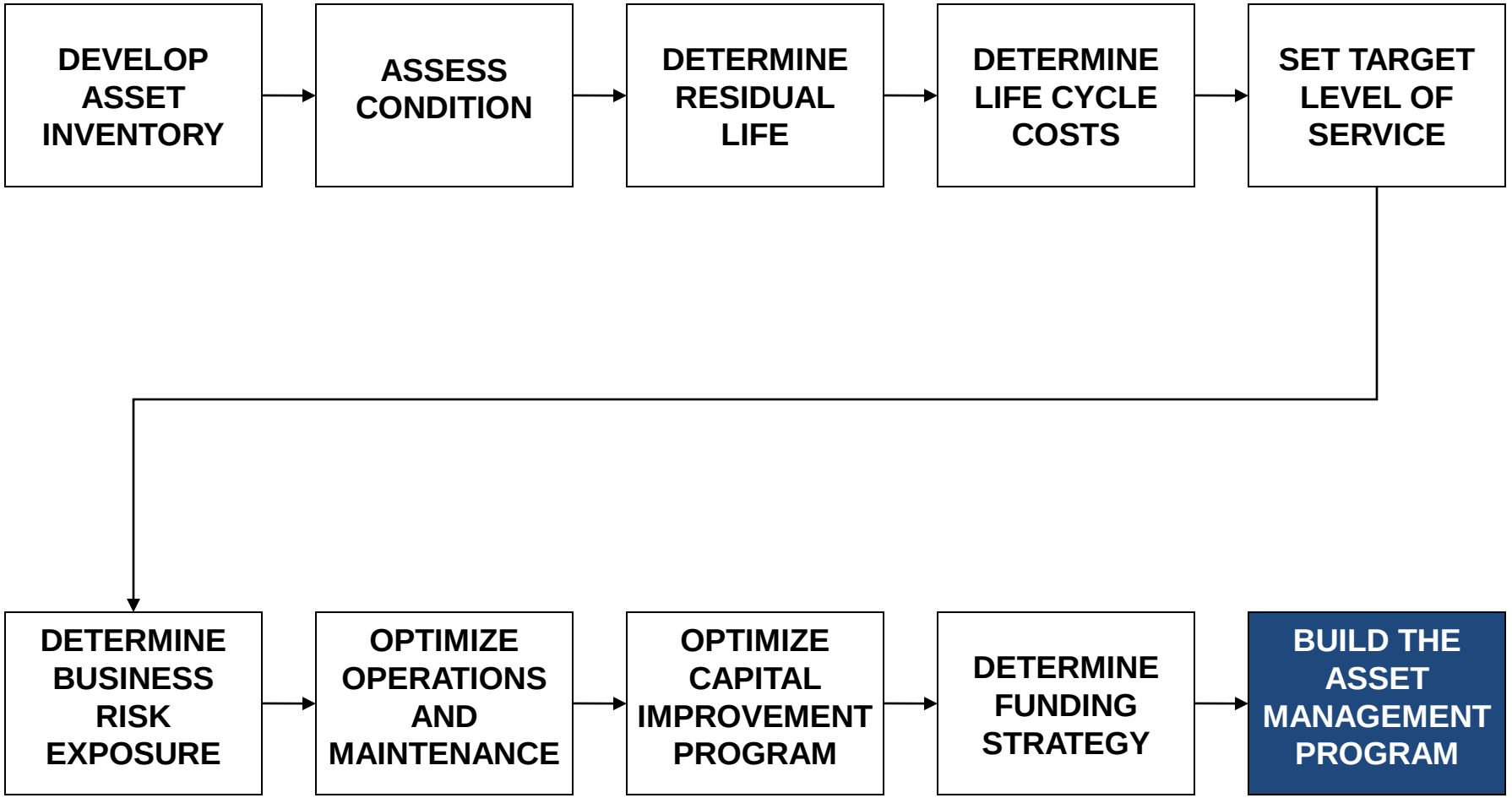
Values escalated to year of construction

Stormwater Utility – Funding vs Need



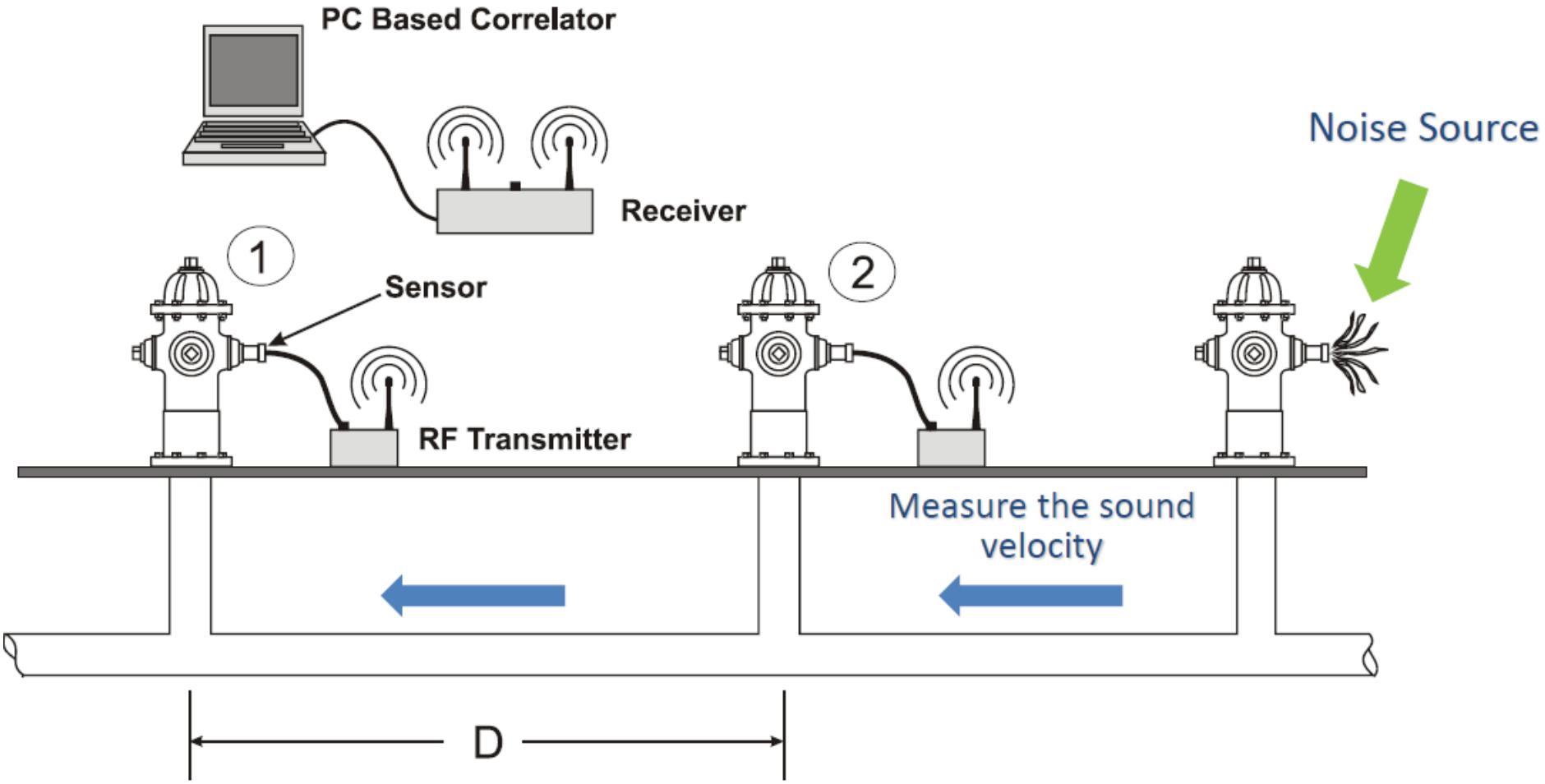
Values escalated to year of construction

Asset Management Ten Core Processes



Improving the Asset Management Program

- New Technologies
  - Condition Assessment
  - Software
- Organizational
- Constant Review
  - What's working
  - What's not working
  - What could be done better


PC Based Correlator
Receiver
Noise Source
1
Sensor
2
RF Transmitter
Measure the sound velocity
D

QUESTIONS?